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ABSTRACT

The first volume of a six-volume final report describes the activities and findings of a research project to identify the policy-related aspects and technology involved in efforts to aid disabled individuals in the United States. In Chapter 1, various types of technology assessments are explained, and general results of the technology assessment study are reviewed. Included in Chapter 2 is information on the 14 representative disabilities studied: spinal cord injury, stroke, cerebral palsy, epilepsy, mental retardation, schizophrenia, rheumatoid arthritis, coronary heart disease, emphysema, cancer of the colon/rectum, kidney disease, diabetes mellitus, hearing impairment, and visual impairment. A third chapter focuses on research findings related to life function needs of the disabled. The 14 specific disability groups (listed above) are used in Chapter 4 to represent the types and distribution of technologies applied throughout rehabilitation. In a fifth chapter, human rehabilitation is discussed in relation to such social and policy aspects as economics, public education, and transportation. Discussed in Chapter 6 are the consequences of implementation of specific programs. A final chapter outlines general policymaking conclusions and recommendations regarding 11 issues. Among appended materials are notes on gathering information on technologies, summarized results from work sessions, and a glossary. (SBH)

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HUMAN REHABILITATION TECHNIQUES

A TECHNOLOGY ASSESSMENT

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VOLUME 1
PART A

FINAL REPORT

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FOREWARD

This document is the first volume of the final report *Human Rehabilitation Techniques: A Technology Assessment*, a project conducted at Texas Tech University by the Department of Industrial Engineering, the Research and Training Center in Mental Retardation, the Department of Systems, and the Technical and Professional Writing Program. The research has been conducted with the support of National Science Foundation grants ERP 75-10594 and ERP 75-10594 A01, monitored by the Directorate for Research Applications, Division of Exploratory Research and Systems Analysis.

Richard A. Dudek, Horn Professor and Chairman of the Department of Industrial Engineering has been a co-principal investigator and director of the project. Gerard J. Bensberg, Director of the Research and Training Center in Mental Retardation, and M.M. Ayoub, Professor of Industrial Engineering, have been co-principal investigators. Carol M. Sigelman and Andrew S. Martin of the Research and Training Center in Mental Retardation and Robert F. Powers of the Department of Industrial Engineering have been program managers for the project. James R. Burns and William M. Marcy of the Department of Systems have been in charge of the modeling used in the project. Technical writing has been performed by Charles W. Brewer and Cynthia E. Lyle of the Technical and Professional Writing Program. In addition, several research assistants and support personnel, as listed in the individual volumes of the study, have contributed to the project.

The project team wishes to acknowledge the efforts of individuals who have served on the Oversight Committee, Elizabeth Boggs, Kan Chen, Beatrix Cobb, Ronald Conley, Richard Herman, John Noble, Jr., Evan Vlachos, and Lester Wolcott; of Lee Phillips who served effectively as a program manager for a short time before leaving Texas Tech; of Brian Lambert who served as Work Session Conference Coordinator; of those who participated in the work-sessions chaired by Ted Hartman, David Malone, Blair Rowley, Evan Vlachos and John Wittman; and of Anne Seitz, the secretary of the project.

The project team also acknowledges the efforts of G. Patrick Johnson of the National Science Foundation who served as project monitor. He offered helpful suggestions and asked searching questions which stimulated the team in several areas of their research.

Although the National Science Foundation has supported this project, the findings, conclusions and recommendations expressed are those of the research team and do not necessarily reflect the views of NSF.

PREFACE

A Technology Assessment: Human Rehabilitation Techniques is a six-volume report detailing the activities and findings of an extensive research effort devoted to identifying the policy-related aspects of efforts to aid disabled persons in the United States.

The first volume of the report is the volume definitive of the entire research effort. It describes the nature of the research project, intermediate findings arrived at during the several stages of the project, and final conclusions and policymaking recommendations from the project. The first volume is designed to be the document reporting information of interest to policymakers relative to the implications of rehabilitation- and disability-related activities in which they are involved. Subsequent volumes contain specialized and detailed technical information about the methodology of the project, specific intermediate results of research, and concrete records of project data gathering.

The second volume of the report is a condensation of the information collected about specific "handicaps" of disabilities. This volume is useful as a resource book documenting disabilities according to the traditional etiological or "disease" categories. By description, by digest, and by bibliography, information about 14 specific case study disabilities such as cerebral palsy is in this volume. This information covers definition, prevalence, incidence, cost estimates, demographic distribution, etiology and life functioning relative to each of the disability case studies.

The third volume of the report is an accumulation of policy-related monographs undertaken by independent experts in support of this study. These monographs describe, for example, the economics of rehabilitation, the educational processes currently related to rehabilitation, and the structure of rehabilitation-related transportation systems and dwellings. A great deal of information about techniques for meeting the needs of the disabled is included in this volume, but little of the totality of what policymakers require for the establishment of rehabilitation-related programs in contained in the volume.

The fourth volume consists of documents either generated during or documenting the various stages of the project. This volume, for example, documents the concepts involved in project data collection and analysis as well as measures used to guard against prejudice and bias. Methodologically and technically, this volume describes several segmental aspects of the project.

The fifth volume is a digest of findings developed during a multidisciplinary conference--a work session--held to verify, stimulate, and enhance the findings of the project team. This volume presents consensus findings of multidisciplinary experts who have dealt with specific areas of rehabilitation technology.

The sixth volume of this report specifically examines the methodology and findings of the geometric-simulation modeling effort which support the consequence- and policymaking-analysis efforts of the technology-assessment team. This volume describes the identification of and projection of rehabilitation-oriented consequences and policies through computer-modeling techniques. These computer-modeling techniques are supportive of the overall effort of uncovering the policymaking implications of rehabilitation techniques.

In essence, volume 1 of this study is a report of the complete findings of this technology assessment, and the supplemental volumes are descriptions of specific supportive efforts which contributed to the study.

EXECUTIVE SUMMARY

This technology assessment is a problem-oriented, multidisciplinary study centering on technology used to assist disabled persons in American society. The study has methodically identified, correlated, and projected through time the major consequences of rehabilitation technology. This identification, correlation, and projection, in turn, has formed a basis for policy-related conclusions about rehabilitation technology and disability. The overall purpose of the study has been to logically map subsystems of American society comprising rehabilitation and disability in order to provide a basis for informed policymaking by citizens and public officials.

The study is a product of work in many disciplines. Work by the project team has included the gathering of information from all sources logically related to rehabilitation, to the disabled, and to sectors of society influenced by policies and practices related to rehabilitation. Special supportive studies on topics currently related to rehabilitation have been undertaken by team members and commissioned from experts independent of the project team. Central to the gathering of information within the project has been a multidisciplinary conference of experts previously unassociated with the project team; this conference produced the basic consequence analysis from which the building of the entire assessment has taken place. Finally, the project has been monitored by an oversight committee composed of experts in many disciplines related to rehabilitation and technology assessment.

The methodology used in the project has been developed to provide reliable and highly integrated information about the policy-related consequences of rehabilitation which might be collected. The initial data base for the project was composed of information about disability, rehabilitation technology, and related broad characteristics of American society. Fourteen representative disabilities have been studied in depth in order to arrive at functionally defined common factors in their limitation of life functioning. Life-function limitations have, in turn, been correlated with technological solutions which satisfy, or might satisfy, these needs. This interrelation between life-function needs of the disabled and the use of technologies, which forms a rehabilitation subsystem of American society, has then been cast into the context of the entirety of the society in order to determine how rehabilitation works on a broader, more policy-related scale. The logical workings of rehabilitation and society have then been projected into the future through the year 2025 under three sets of exogenous socioeconomic conditions representing extremely limited national growth rates, moderate national growth rates, and high national growth rates. The results picture rehabilitation within the multitude of systematic interrelationships of interest in policymaking.

Eleven broad issues--areas of particular relevance in policymaking--have been identified.

Issue 1 outlines problems presented by unstandardized definitions within rehabilitation and presents specific policy-oriented recommendations for solving the problems.

Issue 2 delineates problems in identifying the relationships between disability labels and technologically addressable problems in disability. Recommendations for arriving at a more satisfactory body of information for reliable policymaking are offered.

Issue 3 describes rehabilitation program fragmentation and recommends steps that may be taken to more effectively use rehabilitation technology in solving problems associated with disability.

Issue 4 identifies the potentially paradoxical nature of self-advocacy by the disabled. A context for interpretation of advocacy-oriented information by policymakers is recommended.

Issue 5 describes the logic of the political functioning of disability groups and recommends a policymaking orientation which safeguards equity for the disabled citizenry.

Issue 6 identifies basic problems in handling disability-oriented information in the intelligent formulation of policy which affects many persons and organizations traditionally outside of the "disabled community." Recommendations for the collection of reliable policy-enabling information are offered.

Issue 7 outlines problems relating to the lack of effectiveness in the application of rehabilitation technology and recommends steps for ensuring greater effectiveness.

Issue 8 describes the basic logic of "handicaps" within the contexts of disability, rehabilitation, and society. Recommendations are offered for "social"--as well as "personal"--solutions to problems of handicapped persons.

Issue 9 schematizes the relationship between rehabilitation programs and disabled individuals and recommends ways for more effective structuring of programs.

Issue 10 outlines the rather narrow perspective within which rehabilitation is now carried out in American society. Recommendations for broadening the social perspective to permit more effective rehabilitation programs are offered.

Issue 11 identifies the distinction between rehabilitation and maintenance and recommends that policymaking decisions be based on clear consideration of the distinction.

In addition to the 11 broad issues and associated recommendations, this study includes specific recommendations within the following areas.

Conceptual organization and administration of programs

Political influence and impact

Matching of needs of programs

Finally, the study establishes a perspective for rehabilitation-related policymaking in the future within the context of three distinct social problem areas: (1) rehabilitation and maintenance, (2) population growth and decline (through birth rate and life extension), and (3) energy-availability and economic growth.

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CHAPTER 1

A TECHNOLOGY ASSESSMENT OF HUMAN REHABILITATION TECHNIQUES

A technology assessment may be classified as one of three basic types: project oriented, technology oriented, and problem oriented. The classification which an assessment fits into depends on the means used to identify the technology it reports on.

Project-oriented technology assessments focus on specific plans for technological action. Such projects may include the construction of a coal-gassification plant at a specific location, snowpack-augmentation plans to increase the amount of water in the Colorado River, or the removal of uranium tailings from a specific city. Such assessments are narrow in the scope of technology they consider, and they bear marked resemblance to feasibility studies and environmental-impact statements. If they are truly technology assessments, however, they go much further into the consideration of social consequences.

Technology-oriented assessments focus on the application of a specific technology within various contexts. Such assessments have centered on the automobile, the videotelephone, and remote-sensing technologies. The entire range of application is considered in technology-oriented assessments, and all permutations of the technology within society are explored for counterintuitive consequences.

Problem-oriented technology assessments concentrate on the application of all technologies which may be used to solve broad problems. Such assessments explore the entire spectrum of technologies which may for example enable extraction of energy from the oceans, which may prolong human lifespan, or (as in this project) which may rehabilitate disabled persons. Problem-oriented assessments are generally more complex than other types of assessments because of the requirement that they identify and characterize technologies which are relevant as well as impacts which may occur. Problem-oriented assessments involve mapping out the logical structure of large numbers of technologies in addition to mapping out the potential effects of these technologies upon society.

THE CONTEXT OF HUMAN REHABILITATION TECHNIQUES

The technology assessment described in this report is a problem-oriented project centering on technologies used to assist disabled persons in American society.

Disabled persons compose a significant part of American society. Persons between the ages of 18 and 64 who have disabilities are estimated to include over 23 million people and account for approximately 18.7 percent of all American citizens within the age group (Urban Institute, 1975). In addition to being very numerous in society, disabled persons are becoming a much more visible social and political element of society. Political activism by disabled persons has evolved from such 1960's-style activism as "wheel-in's" into attempts which are traditionally more effective in influencing policy. Legislative effectiveness of this influence accounts for the enactment of the Rehabilitation Act of 1973, a law requiring that affirmative-action plans for employment and promotion of disabled persons be drawn up by both governmental agencies and other organizations contracting with the government. More recent influence is seen in the Congressional mandate for the first White House Conference for Handicapped Individuals, a national forum scheduled to be held during the spring of 1977 to pursue the following goals.

> To provide a national assessment of problems and potentials of individuals with mental or physical handicaps.
>
> To generate a national awareness of these problems and potentials.
>
> To make recommendations to the President and Congress which, if implemented, will enable individuals with handicaps to live their lives independently, with dignity, and with full participation in community life to the greatest degree possible. (HEW, 1976)

At least half of the delegates attending this conference are disabled individuals, and at least a quarter of the delegates are parents of disabled individuals. The conference typifies not only the visibility of the disabled, but also the active role that the disabled are playing in pursuing their own political interests.

The political influence of disabled persons is growing so rapidly that Newsweek identifies the disabled as "the next minority." The resources and tools of "the next minority" may be as effective as similar resources and tools used by previous political minorities. Attitudes behind the use of the resources and tools seem as vehement as those directing other minority factions. Some of the rhetoric offered in support of political activism by the disabled is typified in an article from a law review reprinted for public distribution by The President's Committee for Employment of the Handicapped. The conclusion to the article is as follows.

> The physically disabled are presently second-class citizens. However, they are rebelling against the restraints imposed upon them by society. With better physical and emotional services has come the will to assert their rights.
>
> Several years ago, the disabled became, in the words of the Los Angeles Times, a "pushy new political force." The "Crip Movement" is now expanding from the halls of the

> legislature, to the steps of the courthouse. However, now, those steps are not going to act as barriers but rather as rampways to social integration. (Achtenberg, 1975)

Many other factors indicate that the disabled will continue to be an increasingly visible force in society and social policymaking. Rehabilitation service delivery includes a large number of professional and technical workers whose livelihood depends on increasing social and political support of public aid to the disabled for its own growth. Also, certain trends in rehabilitation technology increase the social and political visibility of the disabled; "mainstreaming" in public schools--the practice of educating disabled students within the same environment used for nondisabled students--is one example of practices which doubtlessly will increase the number of American citizens aware of the identity of disabled persons and aware of the problems associated with disability. It seems altogether probable that the disabled are destined to be a stronger factor in American policymaking than they have been heretofore.

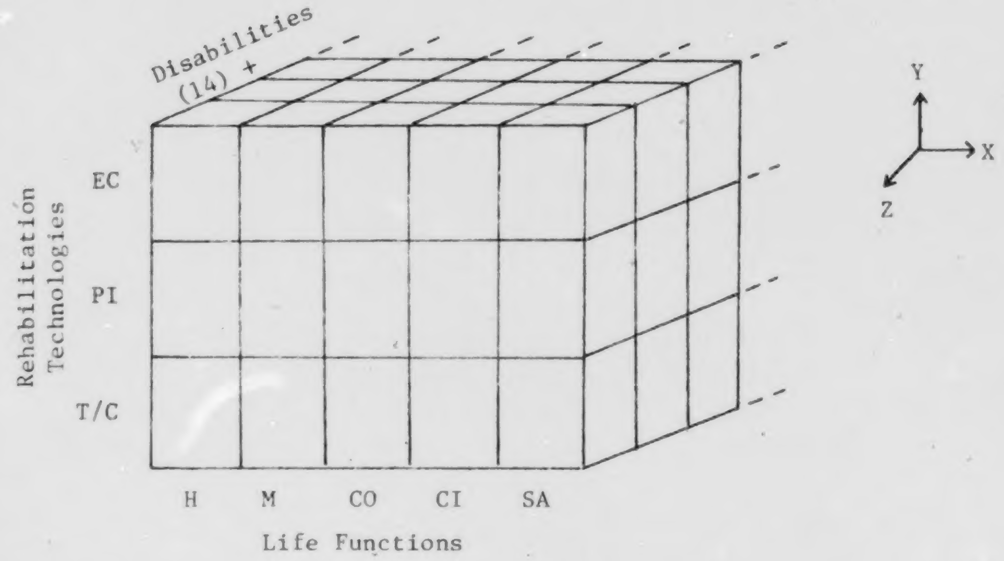
The increasing role that the disabled will probably play in American social, political, and economic decisions points to an increasing need for information about the disabled and about the technologies which are used to assist the disabled. This technology assessment is addressed to this need.

THE STRUCTURE OF THE ASSESSMENT

The project underlying this report has been designed to accomplish three basic tasks: (1) accumulation into logically useable form of a base of information about the disabled, rehabilitation technology, and the social contexts of the technology, (2) assessment of the information base by techniques which might reliably indicate the consequences to society of factors within the technology, (3) extraction of consequences and issues which have potential for becoming policymaking considerations.

The Information Base

The information, upon which many of the later steps of the project have been based, has been compiled through the use of three-dimensional model or matrix. This matrix, shown in figure 1-1 displays the interrelationship of three classifications of information (1) disability-group related information, (2) information about technologically addressable problems involved in rehabilitation of the disabled, and (3) information about rehabilitation technologies.



Code Key

Rehabilitation Technologies (3)
EC=Environmental Change
PI=Physical Intervention
T/C=Training/Counseling

Life Function (5)
H=Health
M=Mobility
CO=Communications
CI=Cognitive Intellectual
SA=Social Attitudinal

Figure 1-1. Multidimensional matrix of life functions (5) x rehabilitation technologies (3) x disabilities (14).

As a conceptual model of information gathering, this matrix functions in three ways: (1) it provides an orderly system of assimilating the tremendous amount of information available for analysis, (2) it shows the primary logical relationship among groups of disabled persons, the needs of these persons, and rehabilitation technologies, and (3) it facilitates inventory, verification, and validation of the information.

The first dimension of the model (along the "Z" axis) arrays information about disability groups. Information about human disability is traditionally referenced by disability group, rather than by technologically addressable problems. Information-base research in the project initially centered on accumulating information about nine basic categories of disabilities. Research has not included more than nine categories for two reasons. First, the nine categories of disabilities, though not exhaustive of all disability categories, include far more than the majority of disabilities which have been addressed by current and foreseeable technology and foreseeable policy concern. Second, consideration of further, more "exotic" categories would, in relation to the analysis, assessment, and reporting tasks within the project, unnecessarily cloud the overall concepts central to disability. A plethora of conceptually unrelated information about disability groups is easy to find in traditional literature, and this project could not substantially clarify all of the literature of disability while simultaneously developing a sound assessment. For similar reasons, all disabilities within each category were not considered. Only those disabilities which seem to be most representative or most seriously disabling within each category have been explored. Also, "temporary" or acute disabilities such as those caused by broken bones and burns have not been studied as a separate disability category. Long-term disabling conditions resulting from such injuries, if they persist past an acute stage, can be viewed within the nine categories of chronic disabilities being considered. The disabilities which have been thoroughly explored and analyzed in this project, listed by disability category, are shown below.

1. Nervous system disorders
    - Traumatic spinal-cord injury
    - Stroke
    - Cerebral palsy
    - Epilepsy
2. Mental disorders
    - Mental retardation
    - Schizophrenia
3. Musculo-skeletal disorders
    - Rheumatoid arthritis
4. Cardiovascular disorders
    - Coronary heart disease
5. Respiratory disorders
    - Emphysema
6. Digestive disorders
    - Cancer of the colon or rectum
7. Urogenital disorders
    - Kidney disease
8. Endocrine-metabolic disorders
    - Diabetes mellitus
9. Sense organ disorders
    - Hearing impairment
    - Visual impairment

These 14 disabilities were shown by research throughout the project to account for most disabled persons in America.

The second dimension of the model (the "X" axis) arrays information by impairments to life functioning.

and symptoms, for example, do not provide much of an indication of the identity and extent of functional needs of disabled individuals within one disability group, and they *a fortiori* do not provide an indication throughout all disability groups and throughout the culture. Such descriptions throw little light on the requirement for or the lack of requirement for policies. Second, medical definitions mask the identity of many functional needs common to several disability groups; medical descriptions disguise, for example, the fact that blind persons, stroke victims, persons with later-stage emphysema, and persons with other disabilities all share common mobility limitations. If policymaking is not based on knowledge about common life-function needs among the disabled, the effects of policies cannot be accurately projected. While a policy of removing sidewalk curbs, for example, may intentionally serve ambulatory stroke victims and persons with later-stage emphysema, the policies may also be detrimental to blind persons who use curbs as a navigational guidepost which guides them in coping with automobile traffic. Third, medical descriptions do not provide information which can easily be related to technology. Technologies, as problem-solving tools, are logically framed as solutions to problems occuring among a group of persons having a disability identified not merely by common etiology, medical symptoms, or the like.

The third dimension of the conceptual model (the "Y" axis) is a three-part classification of technologies which are used to solve problems associated with disabilities. Each category of technology very broadly describes the approach used in various more-concrete technologies within the category. The following list identifies each category and provides a brief definition of each approach.

1. Environmental change
   This category includes technologies which are used to alter the environment of disabled persons in order to lessen the effect of life-function impairment or limitation; examples include the elimination of architectual barriers and the use of visual communication technologies to assist the deaf with verbal communications.

2. Physical intervention
   This category includes technologies which are used to physically alter the disabled person in order to lessen the effect of life-function impairment or limitation; examples include the use of drugs and the use of prosthetic devices.

3. Training and counseling
   This category includes technologies which are used to intellectually, psychologically, or attitudinally alter disabled persons in order to lessen the effect of life-function impairment or limitation; examples include vocational rehabilitation and public school "mainstreaming."

The categories of rehabiliation technologies reflect a logically complete classification of the ways in which technology may be used to help the disabled in society: a disabled person may himself be changed, the world in which he functions may be changed, or the relationship between him and his world may be changed.

A fourth classification of technology which is not shown in the model, service-delivery technology, has also been considered in the project. This classification cuts across all three technology categories to accumulate information about the means used to provide technology-based services to the disabled. Within this category, information about the management, content, and resource requirements for the delivery of services was assembled and analyzed. The information and analysis provides both a generalized view of the application of the technologies within the three categories and a view of related social, economic, and political technologies such as financial and administrative management which are integral to policymaking impacting on the disabled and rehabilitation technologies.

The conceptual model provides a basic picture of how information used in the assessment was gathered and assimilated into a logically useable whole. Information about disabilities and persons in disability groups, through analysis, provides information about life-function impairments and limitations. Information about technologies in general and specific technologies applied to disabilities is correlated within the three technology categories to the life-function needs of the disabled.

Information base taxonomies provided the logical structures for developing the relationships between life-functions needs and rehabilitation technologies. A life-function need taxonomy is exemplified by the tree diagram in figure 1-2, whereas a rehabilitation-technology taxonomy is exemplified by the tree diagram in figure 1-3.

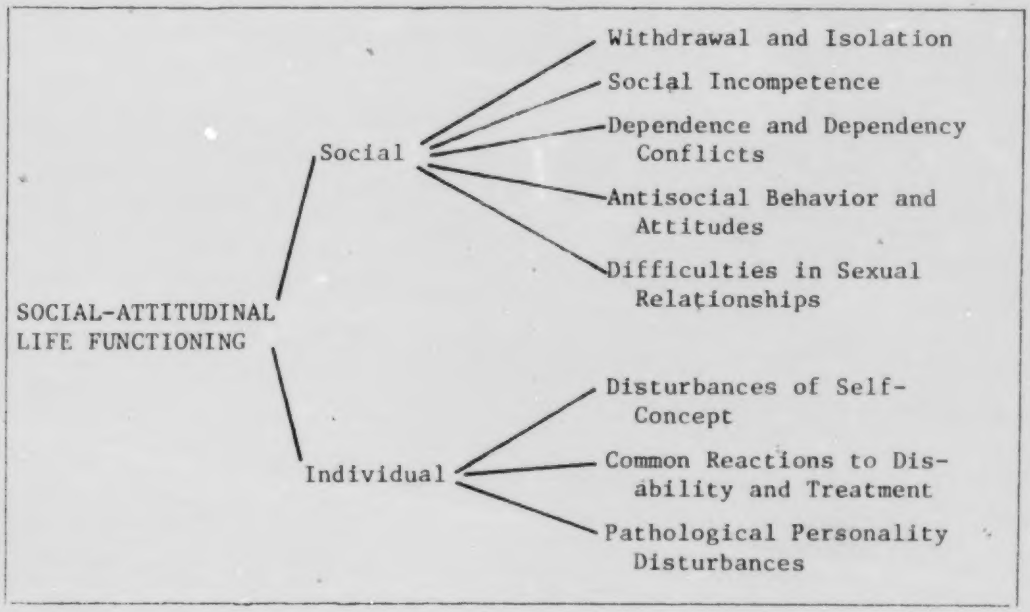

SOCIAL-ATTITUDINAL LIFE FUNCTIONING
Social
Withdrawal and Isolation
Social Incompetence
Dependence and Dependency Conflicts
Antisocial Behavior and Attitudes
Difficulties in Sexual Relationships
Individual
Disturbances of Self-Concept
Common Reactions to Disability and Treatment
Pathological Personality Disturbances

Figure 1-2. A life function need taxonomy

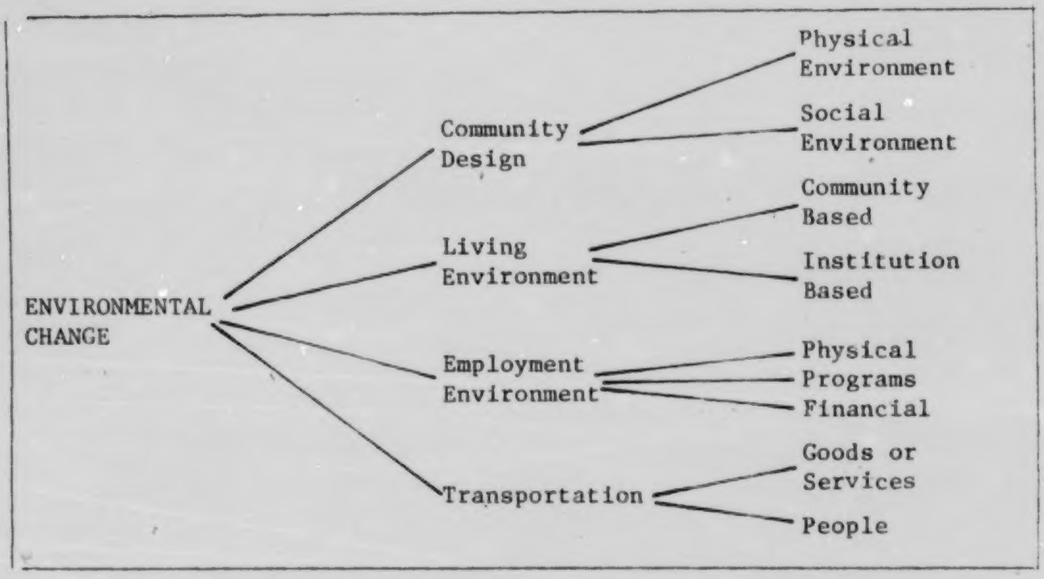

ENVIRONMENTAL CHANGE
Community Design
Living Environment
Employment Environment
Transportation
Physical Environment
Social Environment
Community Based
Institution Based
Physical
Programs
Financial
Goods or Services
People

Figure 1-3. A rehabilitation-technology taxonomy

The taxonomies served as cross-checks between life-function needs and rehabilitation technologies. For example, a life-function need may be addressed by a single technology or by a combination of technologies taken from the three categories of technologies.

Disability- and technology-oriented information is not the only information used in this assessment project. Both disability and rehabilitation technology are central elements in only one small subsystem of American culture, society, and political framework. Disability and rehabilitation technologies are rather large and varying factors endogenous (viz. internal) to the subsystem, but there are factors exogenous (external) to the subsystem that influence it very much. Exogenous factors include all of the interacting variables of the society, such as the well-being of nondisabled citizens, population, economic growth, personal disposable income, moral trends, political influences, and literally thousands of other elements which interact to produce policymaking and are governed by policymaking within the society. These exogenous factors also interact with factors within disability groups and rehabilitation technologies to form the social context within which rehabilitation technologies must be assessed. For this reason, the information base for the project includes past, current, and projected information on American society as a whole.

Information both endogenous and exogenous to rehabilitation formed the total information base for the project. This information base, however, is not a static one which was collected early in the project and used as an inviolable corpus of "data" thereafter. The information base has served as an interactive element throughout the entire assessment process.

The Assessment Process

The assessment process within the project consisted of several parallel paths of activity which in coordination were designed to achieve the following objectives.

1. To ensure, through project management and review techniques, that the methodology, procedures, and results were of high quality throughout each stage of the project.
2. To compile a significant base of information about disabilities to produce a body of literature about life-function impairment.
3. To compile a significant base of information about rehabilitation technologies to produce a body of literature about the subject of this assessment.
4. To compile a body of information about exogenous factors within which rehabilitation technologies could be assessed.
5. To assess, by the use of a reliable method and available expertise on endogenous and exogenous factors, the impacts of rehabilitation technology upon the disabled and American society.
6. To use, through development and implementation, a computer-based simulation model to augment and complement the assessment process.

7. To record and develop policy-related results arrived at through the entire assessment process.

The methods and procedures used to achieve each of these objectives are outlined in the sections that follow.

Project Management:

Project management was directed by principal investigators from the Department of Industrial Engineering and the Research and Training Center in Mental Retardation at Texas Tech University. Routine management and task management used personnel from both organizations in addition to personnel from the Technical and Professional Writing Program and the Department of Systems at Texas Tech University.

The practical management of the project was determined by the interaction of members of the project-management team with members of an oversight committee chosen at the beginning of the project. Oversight-committee members were selected for expertise in technology assessment, disabilities, rehabilitation techniques, and social factors. The committee reviewed and offered suggestions instrumental in the revision of project methodology and supplemented planning by management-team members. In addition to their influence on final project design, members of the oversight committee participated in reviews of results arrived at during various stages of the project, and subsequent to the major activities of the project reviewed the project as a whole. The review and supplementation process in which the oversight committee participated was essential in ensuring the productivity and objectivity of the project from outset to termination.

Compilation of the Information Base:

The information base which was compiled in the initial stages of the project consisted of a series of research papers, each of which examined one of the 14 disability groups chosen for in-depth study. Sources used in compilation of the papers included (1) a search of the literature available on the disabilities, (2) response elicited by questionnaires designed by members of the project-management team and sent to professionals in specific areas of rehabilitation, (3) interviews of persons within disability groups, (4) telephone queries answered by rehabilitation professionals, and (5) personal interviews of rehabilitation professionals. These 14 original papers are collected in volume II of this report.

Information about disability groups was then subjected to analytic study to reduce disability-related information into life-function information. The results of this study were formulated into a paper on life function of the disabled. This paper, which analytically describes life-function impairments and limitations from all 14 disability groups, is included in volume IV of this report.

The information collected about rehabilitation technology was also based on a literature search and interviews with both professionals in rehabilitation technology and disabled persons using rehabilitation technology. Because of the breadth of the study and limitation of resources, speculative applications were not meticulously sought in the broad literature of current technologies, but rehabilitation professionals were asked for speculation on technological applications within their particular problem-defined fields of rehabilitation activity. After this information about rehabilitation technology was available to team members, they analyzed it into taxonomic structures which interrelated it into the four categories of technologies considered in the project. The information and taxonomies were compiled into a project paper which is included in volume IV of this paper.

Experts were engaged to write specific papers in broad technological areas in order to supplement the information base with detailed information integrating the specific technologies and with speculations and projections for application. Expert papers were received in the following areas.

1. Rehabilitation policy and political process
2. Economic considerations in disability
3. Income maintenance and the disabled
4. The future of public education for the handicapped
5. Transportation problems of disabled persons
6. Demand-responsive transportation systems
7. Housing policy and the disabled
8. Housing and residential programming for the handicapped
9. An outline of the law and disabled persons

The papers contracted with experts are included in volume III of this report.

Literature searches, telephone queries, and personal interviews were also used in compiling information about factors exogenous to disability and rehabilitation technologies. This information included indications of political and economic trends, societal attitudes toward disability and rehabilitation, and trend-oriented data which would permit projection of the social contexts of rehabilitation through the year 2025. Three papers were developed to describe exogenous factors: (1) a paper describing the past, present, and future social contexts of rehabilitation, (2) a paper presenting data related to disability, rehabilitation, and broader society, and (3) a paper describing attitudes and issues potentially influential in rehabilitation policymaking. All three papers are included in volume IV of this report.

Assessment Methods:

Assessment methods involved both the development of and the use of techniques specifically suited to the analysis of disability and rehabilitation techniques. These methods were used, in conjunction with methods traditionally successful in technology-assessment projects, to design the following assessment procedure.

1. Definition of objectives which might be achieved by rehabilitation technologies
2. Description of technologies which are and may be available to achieve these objectives
3. Development of state-of-society assumptions and ranges of societal behavior which might affect disability and rehabilitation
4. Identification of areas of potential consequences
5. Analysis of all of the information compiled for potential consequences
6. Identification of alternatives in technology-related policymaking
7. Development of statements identifying policy-related consequences determined throughout the project

These seven steps in the process, however, are not a linear description of information gathering and analysis. Throughout the entire project of 24 months duration, recursive or iterative steps have been followed to ensure that every new piece of information found or every clarification arrived at would be included in the literature of the project at the appropriate point; the disability-oriented information base reported in volumes II and III of this report, for example, contains the "best" information available to project team members throughout the two year span, rather than merely the information from an initial round of searching the literature and interviewing experts and participants in rehabilitation programs.

The first three steps of the assessment process, and to a limited extent the fourth step, were achieved by the compilation of the information base. To some extent, the life-functions paper and the rehabilitation-technologies paper foreshadowed some of the work in step 6 by identifying alternatives in technology-related action and identifying persons who would be affected by various technologies.

Steps 4 through 6 were completed by interaction of both project-team members and a group of independent experts selected to participate in work sessions designed to explore consequences and policy-related issues in each of the four rehabilitation-technology categories. Work-session participants were selected for expertise in rehabilitation technology, medicine, psychology, biomedical engineering, physical therapy, systems analysis, ergonomics, computer modeling, sociology, economics, political science, industry, vocational counseling, national and state government, and other fields of employment, disciplinary study, and interdisciplinary study which included experience and knowledge salient to the subject matter of each session. Each work session included at least one disabled person. One work session considered environmental change, one considered physical intervention, one considered training and counseling, and one considered service delivery. Considerations cutting across technology categories were elicited by having all participants attend and contribute to introductory and concluding sessions and participate in orientation work sessions in other than their specific areas of specialization. Also, during the work session, members for every category-oriented work session were encouraged to interact with members of the other three work sessions in order to compare and contrast methods, procedures, results, conclusion, and problems; such discussion was intended to integrate the individual work sessions both methodologically and substantively in order to achieve the highest possible results. Project members participated minimally in the work sessions, serving principally as expediters and monitors who could ensure that the means were at hand for productive assessment.

The objective of each work session was to explore the project information base and the knowledge of each member in order to determine the consequences of application of individual technologies for impacts on the disabled and the broader society, and subsequently to determine the interactions between policy and that technology. Work-session participants were given a suggested methodology for achieving the objective, but they were also given the explicit understanding that the achievement of objectives (rather than conforming their meetings to the suggested methodology) was the requirement for successful participation. Each of the four work sessions contained a substantial majority of members who believed that they had achieved the objective in reasonably close conformity with the suggested methodology; members of the work sessions also generally agreed that members achieved the consensus in both group dynamics and subject-matter considerations that would validate their findings. The substantive findings of the work sessions, as well as a decription of evaluation measures undertaken by each work session, is contained in a paper documenting the work sessions in volume V of this report.

Subsequent to the work session, the team members recorded the results of the work session as thoroughly as possible. Additionally, the team assessed the impacts associated with the use of these technologies considered during the work session and other technologies using steps 4 through 6.

Step 7 included work by all team members and selected members of the work sessions and oversight committee to produce statements relevant to policymaking consideration which would best represent the assessment work carried on throughout the project.

RESULTS OF THIS STUDY

This technology assessment has produced results of three distinct types.

First, the project has produced an integrated information base within the subjects of disability groups, life-function impairment, and rehabilitation technologies. Within this assessment project, this information base has served to provide the basic "data" from which projections of impacts and consequences of rehabilitation technology have been drawn, but the information base is useful independently of the project as well. This information base is the first widespread attempt to arrive at a consistently drawn and integrated description of the entire spectra of disability groups, life-function impairments, and rehabilitation technologies. Previous to this project, information about these subjects has been scattered among disparate sources which have often contained other than consistent and integratable information.

Second, this project has produced assessment-oriented results. These results consist of many conclusions which may be caused by variables in the application of rehabilitation technology, and they also consist of recommendations for policymaking which are based on these conclusions. These conclusions and recommendations are the policy-related "answers" found by the assessment.

Third, this assessment has produced the methodological basis for further study, information gathering, and assessment of human disabilities, life-function impairments, and rehabilitation technologies. The methods used in this study may be extended to permit intensive examination of, for example, specific disabilities, impairments, and technologies which have, within the context of this study, been only cursorily examined.

CHAPTER 2
REPRESENTATIVE DISABILITIES STUDIED

The representative disabilities studied in this assessment were selected on the basis of five criteria to represent the entire range of disabilities. All of the 14 disabilities fall within nine major categories used in the Social Security Survey of the Disabled: 1966 as established by the Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death (1957). At least one disability has been selected from each of the nine categories; more than one disability has been selected from categories within which disability conditions and effects are known to vary widely. In general, criteria for selecting 14 disabilities within the nine categories include the following:

1. The prevalence of the disability should exceed an estimated 200,000 persons in the United States; the disability is therefore one at which major policymaking efforts might be directed.
2. The disability should be one which frequently results in severe functional impairment or limitation as indicated by the Social Security survey estimates or the guidelines for the Rehabilitation Act of 1973.
3. The disability should be one of *chronic,* rather than acute nature, signifying enduring life-function effects.
4. The disability should be one with survivors, resulting in a need for rehabilitation, rather than one resulting most often in death.
5. The disability should be one affecting persons in a broad range of ages, rather than one affecting only children or elderly persons.

The 14 representative disabilities chosen are shown within their respective categories in figure 2-1.

Nervous System Disorders Paralysis or loss of motor control associated with: (a) Traumatic spinal cord injury (b) Stroke (c) Cerebral Palsy (d) Epilepsy
Mental Disorders Mental Retardation Schizophrenia
Musculo-Skeletal Disorders Rheumatoid Arthritis
Cardiovascular Disorders Coronary Heart Disease
Respiratory and Related Disorders Emphysema
Digestive Disorders Colon/Rectum Cancer
Urogenital Disorders Kidney Diseases
Endocrine-Metabolic Disorders Diabetes Mellitus
Sense Organ Disorders Hearing Impairment Visual Impairment

Figure 2-1. Case study disabilities

The 14 disabilities which have been chosen represent a wide variety of needs. They include a large number of chronic diseases. Two disabilities (mental retardation and schizophrenia) have been selected to represent mental disorders because both are prevalent, and yet the two are quite different in etiology and impact. Among nervous system disorders, epilepsy and three other conditions--cerebral palsy, stroke, and spinal cord injury--have been selected. Each of these three is associated with paralysis or loss of motor control, and yet each is distinct enough to require separate analysis (particularly since all three are classified as severe disabilities in the guidelines to the Vocational Rehabilitation Act of 1973). Two major sensory impairments have been selected because of widely differing effects. All three of the major developmental disabilities--mental retardation, cerebral palsy, and epilepsy--are represented.

Under the Rehabilitation Act of 1973, HEW regulations define a severely handicapped person as follows.

> Has a severe physical or mental disability which seriously limits his functional capacities (mobility, communication, self-care, self-direction, work therapy for work skills) in terms of employability; whose vocational rehabilitation can be expected to require multiple vocational rehabilitation services over an extended period of time; and who has one or more physical or mental disabilities resulting from amputation, arthritis, blindness, cancer, cerebral palsy, cystic fibrosis, deafness, heart disease, hemiplegia, hemophilia, respiratory or pulmonary dysfunction, mental retardation, mental illness, multiple sclerosis, muscular dystrophy, musculo-skeletal disorders, neurological disorders including stroke and epilepsy, paraplegia, quadriplegia, and other spinal cord conditions, sickle cell anemia and end-stage renal disease or another disability or combination of disabilities determined on the basis of an evaluation of rehabilitation potential to cause comparable substantial functional limitation.

Of the 14 representative disabilities, only diabetes is not specifically named in the regulations, although diabetes is known to underlie severe limitation in some cases and to require multiple services over an extended period of time.

TYPES OF INFORMATION COMPILED

The outline shown in figure 2-2 indicates the types of information sought through literature searches and interviews. A detailed description of the specific methods used in collecting the information is contained in volume IV of this report in the paper titled Scope of the Problems of Disability Life Functions.

I. Definitions of the disability group and subgroups

II. Prevalence, incidence and cost estimates
  A. Prevalence
  B. Incidence
  C. Mortality
  D. Costs
  E. Projected prevalence

III. Demographic distribution of the disability
  A. Age
  B. Sex
  C. Ethnicity
  D. Socioeconomic status-education
  E. Urban-rural distribution
  F. Regional distribution

IV. Etiology

V. Life Functions
  A. Health
  B. Mobility
  C. Communication
  D. Cognitive-intellectual functioning
  E. Social-attitudinal functioning

VI. Functioning as members of the labor force and as members of the community

VII. Technologies applied to the group

VIII. Service delivery system

Figure 2-2. Outline of information sought about each disability

The information presented in the following descriptions of the 14 representative disabilities is compiled from project research papers presented in full in volume II of this report. Original source material for the project papers has been collected from the following sources:

1. Available literature describing disabilities.
2. Information provided by rehabilitation professionals in response to questionnaires.

3. Interviews of disabled persons.
4. Telephone queries to rehabilitation professionals.
5. Personal interviews by the project team with rehabilitation professionals.

Sources of specific elements of information are identified in the project research papers in volume II of this report.

LIMITATIONS OF RESULTS OF DISABILITY RESEARCH

Information about representative disabilities included in this chapter does not contain all of the knowledge found during research. Research into disabilities uncovered many problems in the manner in which disability-related information is collected, recorded, maintained, and made available. These problems, many of which bear on the conclusions of this study, are described in detail in appendix A of this volume. As a result, the information presented in this chapter, while based on identification of major trends in the literature on disability, can only provide suggestive portraits of disability groups. It should be borne in mind that much is not known and that within any disability group there are pronounced individual differences.

SPINAL CORD INJURY

Spinal cord injury is basically a severance of the spinal cord which results in motor impairment. A brief description of the disability is given in figure 2-3.

Definition:	Damage to the spinal cord resulting in partial to complete loss of voluntary movement and sensation
Prevalence:	0.08 percent of the population
Demographics:	Sex - males Age - 15-24 Ethnicity - highest for blacks Martial Status - highest among divorced, separated, and never married
Etiology:	Trauma due to an accident Motor vehicle collisions, falls, firearms, recreational or sporting activities, spinal cord diseases

Figure 2-3.

Since the spinal cord is the primary transmitter of all messages to and from the brain, injury to it nearly always results in a great disability. The closer the injury is to the head the more extensive the damage to the body systems. The location of the lesion is important but also the degree of severance is important. Spinal cord injuries are divided into two large categories: those resulting in paraplegia and those resulting in quadriplegia. Paraplegics exhibit paralysis of both legs and the lower part of the body because of injury to the chest and the lower back segments of the spine. Quadriplegics exhibit paralysis of the upper as well as the lower part of the body because of injury to the neck segment of the spine. Spinal cord injuries cause partial to complete loss of voluntary movement and sensation and impairment of the body functions which are dependent upon the autonomic nerve fibers.

Prevalence figures for spinal cord injury range from 0.06 percent to a high of 0.08 percent. The latter figure probably reflects the true situation. The rate of incidence is about 11,200 cases annually.

Incidence rates are three times higher for males than for females and 70 percent of the injured are males. It is most prevalent among 15- to 24-year-olds, with the 20- to 24-year-old group being most vulnerable. Prevalence is higher for blacks than for any other race. Divorced, separated, and never-married persons suffer more frequently from spinal injury than do others.

The most common cause of spinal cord injury is trauma due to an accident. Fifty-six percent of the injuries are caused by motor vehicle collisions, 20 percent are caused by falls, 12 percent are caused by firearms, 7 percent are caused by recreational or sporting activities, and 6 percent are caused by other types of accidents. Diseases may also cause paraplegia. These diseases include cancer and other tumors of the spinal cord, infections and abscesses of the spinal cord, multiple sclerosis, and tuberculosis of the spine.

The paraplegic or quadriplegic experiences many life-function problems, but most are emotional, interpersonal, vocational, and functional. The individual may worry about sexual functioning, the possibility of walking again, future vocational possibilities, adjustment to home and hospital discharge, housing alternatives, financial considerations, family problems, medical problems, and the reactions of the non-handicapped.

Health life functions are often impaired. Decubitus ulcers may form as the result of unrelieved pressure on the bony prominences of the body while the patient is bed-ridden, or later while sitting for prolonged periods in a wheelchair. Autonomic hyperreflexia may develop ranging from mild sweating to severe hypertension with an extremely painful headache, massive diaphoresis, and severe depression. Heterotopic bone formation may start, resulting in the laying down of new bone in soft tissues and making movement difficult. Spasticity is also a problem, causing sleep disturbances, sharp uncontrolled reflexes, increased backaches, and discomfort when braces are worn. Dysfunctioning of the urinary system and reproductive system may also be experienced. In particular, the spinal cord injured person runs a high risk of renal failure.

Mobility functioning is greatly affected, but limitations may be reduced by the use of adaptive equipment. Depending on the level of injury, most victims can learn to care for themselves in the areas of feeding, grooming, writing, dressing, driving, and performing light household duties.

Problems in social-attitudinal functioning result from the loss of physical independence. The patient often feels a loss of control over life. The individual may develop fears about health status, appearance, loss of status in the community and within family, and loss of sexual functioning. Depression and anxiety are primary reactions, but are usually acute and dissipate with time.

The area of communication is not significantly affected; nor is the area of cognitive-intellectual functioning because few of the spinal cord injured suffer from brain damage. In fact some studies have shown that the average level of intelligence of these handicapped persons is higher than that of the general population.

Quadriplegics and paraplegics are employable. The extent of the injury is one factor determining the ease of finding employment, but younger victims are generally more employable than older ones. Other factors which positively influence employment are urban geographical location, high level of intelligence, positive motivation, sustained good health, ability to drive a car, and a good work record prior to the disability. The positions filled by the spinal cord injured include clerical, sales, professional, technical, and managerial positions.

Because of physical limitations, there is an inevitable reduction in community activities. Many recreational activities do not involve physical abilities, but do involve mental abilities, and the spinal cord injured person can participate in these activities. Currently, a spinal-cord-injured individual's quality of life is less than that of the normal population. The spinal cord injured sometimes view themselves as a misunderstood minority, with the general population lacking adequate information on many aspects of their disability.

Functioning as a member of the family is often limited if the individual cannot meet demands and must limit participation in family activities. Role reversal is a problem for some families, especially if the wife must take on the financial responsibilities.

STROKE

A brief description of the disability of stroke follows in figure 2-4.

Definition:	Condition caused by acute vascular lesions of the brain, such as hemorrhage, thrombosis or embolism, and marked by coma followed by paralyses
Prevalence:	0.8 percent of the population
Demographics:	Age - majority of the victims are over age 65 Ethnicity - more frequent in non-whites Urban/Rural - lower in communities under 5,000 population Geographic - more frequent in southeastern states, lowest in the southwestern and mountain regions
Etiology:	Cerebral thrombosis, cerebral hemorrhage, cerebral embolism

Figure 2-4.

Stroke is identified by several different terms. Apoplexy, cerebrovascular accident, and cerebral vascular accident are the more common terms used. Disablement occurs when an artery in the brain either ruptures and bleeds or is blocked. The victim may lose consciousness, and some part of the body becomes paralyzed temporarily.

Approximately two million persons have been victims of stroke. Estimates of the prevalence of stroke range from a low percentage figure of 0.8 to a high percentage figure of 1.1, with the best estimate being 0.8 percent of the population. Stroke takes approximately 400,000 new victims annually. The incidence of stroke may tend to increase in the future because of longer life spans.

Mortality rates for stroke have decreased in the last few years. The reduction is due to medical advancement and better care and treatment. Twenty percent of the reduction is estimated to be due to the widespread effectiveness of drugs for the control of hypertension and the reduction of high blood pressure.

Stroke is associated with the demographic variables of age, ethnicity, urban/rural area, and geographic region. Almost all stroke victims are over the age of 40, and the majority are over 65. In fact, 70 percent of all strokes and 80 percent of stroke deaths occur among persons over age 65. Non-whites die of stroke two to six times more often than whites. The incidence of strokes caused by thrombosis is lower in communities under 5,000 population than in larger areas. Studies have concluded that the highest death rates from stroke are in the southeastern states, and the lowest rates are in the southwestern and mountain regions.

The three main causes of cerebral vascular accidents are cerebral thrombosis, cerebral hemorrhage, and cerebral embolism. These three etiologies account for 90 percent of all strokes. Compression and spasm are also causes but account for only about 10 percent of strokes. Cerebral thrombosis is the formation of a clot, and it accounts for 64 percent of the stroke incidents. Hemorrhaging, accounting for 19 percent of all strokes, is bleeding from a wall of an artery in the brain that causes damage to surrounding brain tissue. Embolism occurs when a floating clot blocks a blood vessel, and is responsible for 7 percent of strokes. Compression is pressure on a blood vessel that stops the flow of blood, and spasm is the closing down of the walls of an artery. Risk factors associated with stroke include hypertension, obesity, cigarette smoking, hypercholestermia, atherosclerosis, heart disease, diabetes mellitus, and congenital defects.

Stroke affects all five life functions. Mobility is impaired by paralysis, spasticity, loss of equilibrium, loss of voluntary motor power, stiff or weakenend joints, loss of muscular strength and endurance, and loss of hand function. The stroke victim has a tendency to fall because of loss of equilibrium. Difficulties in daily living activities--e.g., getting in and out of bed--and in negotiating environments--e.g., using public transportation--are also experienced as a result of mobility limitations.

Health functions are also impaired by stroke. Some of the health problems that stroke victims are faced with are ischemic ulcers, circulatory deterioration, metabolic imbalance, urinary tract dysfunction, respiratory complications, severe headaches, convulsions, permanent deformities, spatial delusions or hallucinations, muscular contractions, paralysis of the face, and the loss of taste and smell.

Stroke often affects social-attitudinal functioning by causing feelings of fear and anxiety and dependency conflicts. The victim often feels depressed, angry, isolated, and lonely. The use of ego defense mechanisms such as denial and projection may also be noted in stroke patients who have not yet adapted to their condition.

Cognitive-intellectual functioning may be impaired as evidenced by limited memory span, decrease in powers of grasp and comprehension, and an inability to concentrate. Perceptual disturbances caused by underlying brain damage may also occur.

Communication is greatly affected by paralysis. The stroke victim has difficulty communicating needs. Speech may become difficult, and writing is often impaired because of loss of hand functions.

Stroke patients are able to return to work, but usually the work situation must be altered. The patient may be slower in working, may have the use of only one arm, may be speech handicapped, or may manifest less emotional control. A stroke victim returning to work should consult the employer about the individual's limitations and the possibility of altering the work situation.

A stroke patient is able to become a functioning member of the community with proper encouragement and support from family and friends. The patient may have speech handicaps, but is still capable of rational thought. Proper rehabilitation and treatment, and the loving support of family and friends, enable a stroke patient to become a member of the community.

CEREBRAL PALSY

Cerebral palsy is a motor disability caused by brain dysfunction. A brief description of the disability is given in figure 2-5.

Definition:	A group of conditions, usually originating in childhood, characterized by paralysis, weakness, incoordination or any other aberration of motor function caused by pathology of the motor control centers of the brain. In addition to such motor dysfunction, cerebral palsy may include learning difficulties, psychological problems, sensory defects, and convulsive and behavioral disorders of genetic origin.
Prevalence:	0.3 percent of the population
Demographics:	Age - under 21 More prevalent in babies born to older women
Etiology:	Brain damage associated with prenatal and natal difficulties; premature birth and diseases such as encephalitis and meningitis.

Figure 2-5.

Cerebral palsy is a disabling condition with multiple effects. The condition is basically a physical disability resulting from non-progressive intra-cranial lesions. Disability ranges in degrees from mild incoordination to complete helplessness. The cause of the condition is some type of general brain damage which may result in convulsions, mental retardation, visual and hearing and other perceptual problems, speech impairment, or behavioral and emotional disorders. Because the disease takes no characteristic course, treatment is difficult.

A number of classification schemes, using different criteria, have been devised for cerebral palsy. The most common classification system is based upon motor manifestations of the disability. Classifications of cerebral palsy include spasticity, athetosis, ataxia, rigidity, tremors, and mixed forms. Spasticity affects the largest number of cerebral palsied persons. Conditions associated with spasticity include contracted muscles, hyperactive reflexes, and hypertonicity. The second largest group is classified as athetosis. Symptoms of athetosis are inability of gross directional control; uncontrolled, jerky, irregular twisting; and almost constant, purposeless motion. Ataxia is less prevalent and involves a disturbance of balance. Rigidity and tremor are somewhat rare forms of cerebral palsy.

Many mild cases of cerebral palsy go unnoticed or undiagnosed, making it difficult to obtain accurate figures on the prevalence and incidence of the disease. Estimates of prevalence range from a low of 0.1 percent of the population to a high of 0.4 percent with the best estimate at about 0.3 percent. An estimated 15,000 babies are born annually with cerebral palsy, and one child in every 200 live births has the condition. Of the children born with cerebral palsy, only two thirds live past their tenth birthdays.

There are no economic, social, or geographical factors directly associated with cerebral palsy. One-third of all individuals with cerebral palsy are under 21 years of age.

Cerebral palsy is caused by damage to the brain. The area of the brain affected dictates the class of cerebral palsy that occurs. Thirty percent of all cerebral palsy cases are associated with prenatal factors which include genetic defects and injuries suffered by the developing fetus. Incidents that occur between the time of labor and delivery account for approximately 60 percent of all cases. Other factors of the condition include infections of the brain tissue, such as encephalitis and meningitis, accounting for less than 10 percent of the cases. Forty percent of cerebral palsied children are born prematurely, and they are often born to older women.

All life functions are affected by cerebral palsy. Seventy percent of the cerebral palsied population manifest intellectual retardation with an estimated 50 percent receiving a diagnosis of mental retardation. In addition, 50 to 75 percent experience speech impairments, 50 percent experience visual problems, and 25 to 35 percent experience hearing disorders.

Mobility is affected by several symptoms of the disease. Cerebral palsy may result in paralysis, pronounced incoordination, difficulty in controlling sitting and standing and walking, lack of synchronization of muscle groups, difficulties in bending joints, inability of gross directional control, almost constant motion of extremities (tremor), spasms of laughter or crying with no emotional correlates, a lurching, stumbling gait, writhing and wriggling, and/or constant shaking.

Cerebral palsy can negatively affect an individual's overall health. Cerebral palsied individuals with severe mobility impairments may have difficulties performing routine personal hygiene tasks of bathing, dressing, and eating, deficits which may obviously contribute to or exacerbate existing health problems. Further, it has been estimated that 25 to 35 percent of the cerebral palsied population suffers from epileptic seizures. Loss of appetite, abdominal cramps, and nasal congestion are caused by certain drugs used in the treatment of cerebral palsy.

Intellectual impairment is the most serious handicap associated with cerebral palsy. Thirty-three percent of the cerebral palsied children in the United States are mentally normal and are capable of being integrated into society, but mental retardation is a serious problem for an estimated 25 to 50 percent of the cerebral palsied population. The high incidence of mental retardation is largely due to the significant reduction of perceptual and cognitive skills which are associated with learning disabilities, emotional liability, short attention span, low frustration thresholds, impulsivity, and distractibility.

Problems of vision, hearing, speech, and visual-motor perception are often present in individuals with cerebral palsy. Visuoperceptual disorders associated with cerebral palsy include visual field deficits (myopia) and other visual anomalies such as turning of eyes inward and outward (strobismus) due to eye muscle abnormalities. Disorders of these types impair academic performance, hinder recognition of shapes and patterns, sorting or matching objects according to shape, copying forms from memory, and spatial orientation. Defective speech is the most common type of handicap associated with cerebral palsy. Speech impairments among the cerebral palsy population range from mild dysanthia to a complete inability to speak. Other speech defects include voice disorders, stuttering, and aphasia. Hearing impairments, though less frequent than speech impairments, have been noted in 25 to 35 percent of the total cerebral palsy population.

Social-attitudinal impairments are often the result of the internalization of the nondisabled population's attitudes towards individuals with cerebral palsy. Some of these difficulties in personal and social functioning are denial of the handicap, self-rejection, dependency feelings, conflicts, and denial of normal group experience due to physical limitations and sometimes because of family prohibitions.

Of the 14 disability groups, cerebral palsied persons have the greatest difficulty in locating employment. The causes of this difficulty in finding employment include employer reluctance and the severity of impairment. In 1967, the President's Committee on Employment of the Handicapped reported 200,000 cerebral palsied individuals to be of working age, but only a few were actually employed.

Difficulty in becoming a functioning member of the community is often caused by parents who either do not accept the fact that their child is handicapped or who are overprotective. Unaccepting and denying parents may further impair the child by not allowing the child to receive the earliest possible treatment. Also, many times speech impairments cause children to withdraw from society because of their lack of sufficient communication skills. Interaction with nondisabled peers is often a problem due to the stigmatization of cerebral palsy.

EPILEPSY

Epilepsy is a disorder of the central nervous system; a brief description of the disability is tabled in figure 2-6.

Definition:	Symptom of a disorder of the central nervous system characterized by sudden seizures due to abnormal electrical discharges of brain cells
Prevalence:	0.5 percent of the population
Demographics:	Age - before age 20 Sex - more frequent in females under 5 years of age; more frequent in males 10 years and older Ethnicity - higher for blacks Geographic - high in the south and east
Etiology:	Injury to the brain, head wounds, chemical imbalance, anoxia, childhood fevers, disease, brain tumors, and poisons

Figure 2-6.

The International League Against Epilepsy defines epilepsy as a "chronic condition of various etiologies characterized by recurrent epileptic seizures, no matter what clinical or laboratory signs and symptoms are associated." The Epilepsy Foundation of America defines epilepsy as a "symptom of a disorder of the central nervous system characterized by sudden seizures due to abnormal electrical discharges of brain cells." A main characteristic of all forms of epilepsy is recurrent seizures. The three major types are petit mal, grand mal, and focal. Petit mal refers to the classic type of epilepsy associated with 3 per second spike and wave electrical discharges. Grand mal is the most common type of convulsive seizure. Focal seizures originate in an isolated brain region and produce symptoms related to that area.

Prevalence figures are inaccurate because many persons hide their conditions due to social stigma. The best estimate of the prevalence of detected cases of epilepsy is 0.5 percent of the population. It is estimated that as much as 2 percent of the total United States population, or a minimum of 4 million persons, have detected or undetected epilepsy. One out of every 50 persons will develop some form of epilepsy during his lifetime. New cases total approximately 70,000 annually.

The onset of epilepsy occurs during three peak periods: during the first two years of life, between the ages of 5 and 7, and at the beginning of puberty. Convulsive seizures are more frequent in females through age 5, occur equally in males and females during ages 5 to 9, and are more frequent in males 10 years and older. Epilepsy mortality rates are much higher for blacks. Occurrence of epilepsy is more frequent in the south and east, a situation which is likely due to larger numbers of blacks in these regions.

Epilepsy has a number of causes. The causes include injury to the brain, head wounds, chemical imbalance, anoxia, childhood fevers, disease, brain tumors, and poisons. Epilepsy may occur when one of these causative factors affects the central nervous system.

Health problems associated with epilepsy vary according to seizure type. Continued convulsions cause fever; stress in the heart, lungs, and kidneys; and imbalance of electrolytes. Temporal lobe seizures may cause somatic hallucinations that affect smell, taste, hearing, vision, and movement. Grand mal seizures cause the patient to become weak and lapse into a coma. When the patient regains consciousness, the individual may complain of drowsiness and headaches. Additional health problems are caused by drugs taken to control seizures. Side effects from drugs include drowsiness, irritability, rashes, problems in formation of blood, and megloblastic anemia.

Social-attitudinal functioning is often altered by epilepsy. Epileptics may experience auras--personality and behavioral changes, occurring as early as 24 to 48 hours before an attack. These auras may include feelings of anxiety, fear, depression, paranoia, and somatic and perceptual hallucinations. After an attack, the patient may be confused, restless, irritable, and/or incoherent. The emotional disturbances manifested by some epileptics are probably attributable more to society's misunderstanding of the disorder and the individuals' difficulties in dealing with restrictions the disorder imposes than to any pathology associated in a direct way with epilepsy.

Cognitive-intellectual functioning is sometimes impaired. Factors influencing the impairment of intelligence are age at onset, medication, brain damage, and frequency and severity of seizures. The earlier the onset of the disease, the greater the cognitive-intellectual impairment. Epileptics show a frequency of mental retardation that is three to four times that of the general population. Psychomotor seizures occurring during grand mal and petit mal attacks sometimes hinder learning ability. Petit mal attacks may result in impaired concentration and scholastic performance. Temporal lobe seizures may cause memory disturbances.

The National Epilepsy League reports that 80 percent of those with epilepsy can be gainfully employed. Medication allows 50 percent to have complete seizure control and 30 percent to have partial control. A study of employers in six states shows that employers tend to discriminate against persons with epilepsy more often than they do persons with other disabilities. Employers are concerned that the epileptics may injure themselves or other workers and that they might take off from work too much. Most epileptics are capable of full employment; developing positive attitudes of employers and co-workers would facilitate full employment.

Parents often determine whether or not an epileptic is able to function in the community. If the parents are embarrassed by their child's handicap and keep the child away from others, the child may become anti-social and unable to function in the community. Overprotective parents reinforce the child's feelings of being different. The child should be allowed to live as normal a life as possible at play and school. Studies indicate that epileptics have fewer seizures if they are allowed to lead active productive lives.

MENTAL RETARDATION

A brief description of the disability of mental retardation follows in figure 2-7.

Definition:	Significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period
Prevalence:	2 percent of the population
Demographics:	Sex - more frequent in males Race - more frequent in non-whites Socioeconomic - more frequent in low income groups Geographic - more frequent in isolated rural areas and urban ghettos
Etiology:	Metabolic disorders, infections, chromosomal disorder, the Rh factor, social-cultural deprivation, pregnancy and childbirth abnormalities

Figure 2-7.

The best definition of mental retardation is given by the American Association on Mental Deficiency. Mental retardation is defined as significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period. Significantly subaverage is defined as two or more standard deviations below the mean of the IQ test. An exact definition of subaverage is 68 or below on the Stanford-Binet IQ test, and 69 or below on the Wechsler IQ test.

Estimates of the prevalence of mental retardation suggest a low percentage figure of 1 and a high percentage figure of 3, with the best estimate being 2 percent of the United States population. One percent of the adult population is estimated to be retarded, while 3 percent of the school-aged population is probably mentally retarded. The rate of occurrence of mental retardation seems to be increasing. A possible reason for the increase is that medical science can now save many more babies who are born with severe and multiple handicaps.

Most deaths of mentally retarded persons occur within the first year of life. Half of the children who die during the first year of life would have been severely handicapped if they had lived. Nine out of 10 persons born with IQs lower than 25 die within the first five years of life.

Mental retardation is distributed differentially by sex, race, socioeconomic status, and geographic region. Males tend to be classified as retarded more often than females. Mental retardation is six to seven times more prevalent among non-whites than among whites, although culturally biased IQ tests may mean these estimates are inflated. Very low income groups have a prevalence of retardation that is 13 times greater than the prevalence for middle or upper income groups. Retardation is also more frequent in isolated rural areas and urban ghettos.

The etiology of mental retardation is varied and sometimes unclear. Some of the possible causes are metabolic disorders, infections, chromosomal disorders, and the Rh factor. Prematurity and low birth weight seem to be associated with mental retardation. Difficulty arises in determining the etiology of retardation because mental retardation is often accompanied by other disabilities. It is difficult to determine which factors are related to the retardation and which are related to the accompanying disability. However, the majority of mentally retarded persons (some estimates place the figure at 80 percent) are "cultural-familial" retardates who have no organic abnormalities and whose retardation is attributed to environmental factors.

Mental retardation affects all of the life functions. Retarded children are often slow in achieving motor development, and some may never learn to walk. The retardate experiences handicaps in the areas of gross motor control and fine motor control. Retarded persons are usually not allowed to drive automobiles and must be taught how to travel by walking or by using public transportation. The more severely retarded must also be taught the basic physical education skills of balance, locomotion, and fundamental body mechanics.

The most severe problem in the area of health is the high death rate. High death rates of the retarded are caused by serious physical ailments that often accompany organic retardation.

Communication is another problem area for the mentally retarded. Specific problem areas are speech, language, and hearing. Speech problems include articulation difficulties, voice problems, and stuttering. More than half of the retarded have speech defects. Ten to 15 percent have hearing impairments, and 10 to 15 percent have visual impairments.

The most severe impairments for mentally retarded persons, by definition, are cognitive-intellectual. Learning, remembering, and transferring learning to new situations are major problems.

Social-attitudinal functioning is often affected by lowered self-esteem, conditioned helplessness, socially inappropriate behavior, and sexual inadequacies.

The degree of retardation is the primary factor determining whether or not a retardate is able to function in the labor force. Within the mildly retarded population, males are employed more often than females. Whites are employed more often than blacks. Retarded black females have higher rates of employment than white or Puerto Rican females. Of the mildly retarded males, according to one estimate, 87 percent have been employed at one time or another. This percentage was 4 percent below the non-retarded male employment rate. Of the retarded females, 33 percent have been employed at one time or another. This percentage is 12 percent below the non-retarded female rate. Employers are learning that mentally retarded persons work well in positions with high turn-over rates and requiring little skill; meanwhile, research is demonstrating that even the severely retarded can be trained to perform complex assembly jobs.

The family must decide whether to keep the retardate at home or have the person institutionalized. Through treatment and education, the retarded person is usually able to function in the community and lead a useful and satisfying life. The majority of the retarded marry and are partially or totally self-supporting.

SCHIZOPHRENIA

Schizophrenia is a mental disorder; a brief description of the disability is given in figure 2-8.

Definition:	General loosening of associative connections and of the organization of thought and behavior
Prevalence:	0.3 percent of the population
Demographics:	Age - 25-44 age group Sex - no trend Race - more frequent among non-whites Socioeconomic - lower socioeconomic classes
Etiology:	Inheritance, broken and disturbed homes, unfavorable environment, metabolic/chemical abnormalities

Figure 2-8.

Schizophrenia describes a complex mental disorder which is characterized by a general loosening of associative connections and of the organization of thought and behavior. The disorder affects all aspects of the personality and is characterized by disturbances of thinking, mood, and behavior. The schizophrenic experiences alterations of concept formation, misinterpretations of reality, hallucinations, delusions, inappropriate emotional responses, and general loss of empathy with others. Schizophrenia is usually diagnosed in patients between the ages of puberty and 44 years. There are a number of different types of schizophrenia. The classification system currently in use includes simple, mixed, and chronic undifferentiated. Due to the complexity of the disorder, diagnosis is often difficult.

Estimates of the prevalence of schizophrenia range from a low figure of 0.1 percent to a high of 0.4 percent of the total United States population with the best estimate being 0.3 percent. It has been further estimated that for every 1,000 children born, between 14 and 20 will be hospitalized at some point in their lifetimes because of schizophrenia. Females, non-whites, and the lower socioeconomic classes appear to be more susceptible to this disability.

While the etiology of schizophrenia is a subject of much controversy, a great deal of evidence points to a combination of predisposing and precipitating factors. Inheritance, broken and disturbed homes, metabolic/chemical abnormalities, and unfavorable environmental conditions all appear to contribute to the development of schizophrenia.

Schizophrenia has a major effect on all of the life functions. Impairments in mobility functioning include catatonic rigidity, loss of muscle tone, and slowness in responding to stimuli.

Impairments in health functioning include extreme weight loss due to changes in taste perception which cause food to taste bad; allergic reactions to common foods; impotency and atrophy of the male gonads; and vitamin B-3 and B-6 dependency in some causes. Pronounced fatigue and listlessness, commonly associated with schizophrenia, may also be very debilitating.

Many problems are found in the area of communication. The patient may experience auditory and visual hallucinations. Schizophrenics also manifest peculiar disturbances of speech. These include cryptic language, opposite speech (using yes for no), and use of neologisms. These disturbances reflect the basic underlying thought disorder which is characteristic of schizophrenia.

Cognitive-intellectual impairments associated with schizophrenia are not thought to constitute actual cognitive deficits, but are possibly due to non-intellectual factors such as motivation and attention. The thought disorder is manifested by disturbances in logic, reasoning, and concreteness of thought with a concomitant reduction of the ability to think in the abstract, deficits in reality testing, perseveration (inappropriate persistence and repetition of ideas), difficulties in attending to relevant details, and excessive sensitivity to irrelevant sensory inputs.

In the social-attitudinal life function, the schizophrenic is significantly impaired because of the social isolation and interpersonal withdrawal characteristic of the condition. In the incipient stages, the schizophrenic may have increasing difficulties in managing interpersonal relationships, and many schizophrenics have histories of problems in relating effectively with the opposite sex. Many schizophrenics, though not all, manifest anti-social behaviors such as self-mutilation, acting-out behaviors, and suicide.

Schizophrenics reportedly have little involvement in the labor force. Few are able to function as active members of the work force much of the time. Many schizophrenics have very weak occupational identity, while many others are considered too sick to work with other people or even within their own families. Those who are able to find work may sometimes be quickly discharged because of emotional episodes, interpersonal trouble with co-workers, or poor job performance related to their mental problems.

Schizophrenics also have a difficult time trying to become members of the community. Some have friends and companions and are able to relate to other people, but because of unpleasant or unusual social habits, some schizophrenics have no close friends. Social activities are often passive, and the individual may spend much of his time alone. Schizophrenia is sometimes associated with breakdowns in the family and sexual adjustment problems.

RHEUMATOID ARTHRITIS

A brief description of the disability of rheumatoid arthritis follows in figure 2-9.

Definition:	Chronic disease of the joints, usually polyarticular (affecting many joints), marked by inflammatory changes in the synovial membranes and articular structures and by atrophy and rarefaction (diminution in density and weight) of the bones. In late stages deformity and ankylosis (abnormal immobility and consolidation of a joint) develop. Also called atrophic arthritis, chronic infectious arthritis, and proliferative arthritis
Prevalence:	1.5 percent of the population
Demographics:	Sex - more in females Age - 20-50 age group
Etiology:	Autoimmunity, infection

Figure 2-9.

Arthritis is basically the inflammation of a joint, accompanied by stiffness, pain, and swelling. Dorland's Illustrated Medical Dictionary defines arthritis as a

> chronic disease of the joints, usually polyarticular (affecting many joints), marked by inflammatory changes in the synovial membranes and articular structures and by atrophy and rarefaction (diminution in density and weight) of the bones.

"Arthritis" is a generic term commonly used in the United States to refer to all types of rheumatoid arthritis as well as rheumatism. Rheumatoid arthritis specifically accounts for approximately one-fourth of the total arthritic population. Estimates of its prevalence are quite divergent--as low as 1 percent of the total population and as high as 6.7 percent. The most accurate estimate is probably around 1.5 percent.

The incidence of rheumatoid arthritis has been estimated at 600,000 new cases annually.

Rheumatoid arthritis most often stikes females. Age of onset is primarily between the ages of 20 and 50, but the most vulnerable period appears to be around 40.

While a definitive etiology of rheumatoid arthritis remains unknown, two main theories have emerged from the relevant research: (1) the theory of autoimmunity implicates a malfunction of body chemistry which causes the body to produce antibodies which attack its own joints and tissues; (2) the infection or viral theory suggests that an infection caused by a germ or virus may set off a chain of events leading to rheumatoid arthritis.

The four life functions which are most affected by the condition are health, mobility, communication, and social-attitudinal. Cognitive-intellectual functioning is the only area not directly affected by the disability. Health problems include pain, swelling nodules in the lungs or pleura, ulceration of the skin, inflammation, fever, digestive impairments, anemia, bursitis, and spinal-cord compression.

Health problems, especially pain, swelling, and stiffness, impact mobility by greatly restricting the range of activities. The patient is faced with limitations in performing household tasks, grooming, dressing, lifting, grasping objects, and bending. Sometimes the arthritic is confined to a wheelchair. Mobility impairments may also create problems in communication. For example, many patients have trouble grasping objects, thus impairing their ability to hold telephone receivers or writing instruments.

With regard to the social-attitudinal life function, personality inventories and projective tests have shown arthritics, as a group, to be depressed, paranoid, bitter, and fearful. A major social consequence of restricted mobility, regardless of cause, however, is isolation and frustration. Arthritics may suffer a loss of self-esteem due to the need to depend on others for help in daily activities and personal hygiene.

Individuals with rheumatoid arthritis are usually limited in the types of work they can perform. Impairments associated with the condition often do not allow periods of standing, walking, climbing, and/or lifting. Many hand and arm activities are difficult. Vocational rehabilitation may be necessary before the arthritic is able to rejoin the labor force.

Handicaps caused by arthritis may not only limit a person's social activities, but may also lead to the victim's isolation from the family and friends. The patient may become depressed and the necessary dependence on others may lead to guilt and fear. Arthritics are often exploited by the media and unqualified persons who promulgate "cures." More than $300,000 is spent by arthritis sufferers annually on worthless (and sometimes harmful) treatments.

CORONARY HEART DISEASE

Coronary heart disease is a cardiovascular disorder; a brief description of the disability is tabled in figure 2-10.

Definition:	An obstruction or narrowing of coronary arteries, reducing the blood supply to the heart muscle
Prevalence:	2 percent of the population
Demographics:	Sex - higher in males Age - 65 to 74 years of age Socioeconomic - lower for family incomes over $10,000; less for working men than retired; less for working females than for housekeeping females Urban/rural - more in urban areas
Etiology:	Elevated serum cholesterol level, hypertension, diabetes, obesity, lack of exercise, smoking, heredity

Figure 2-10.

Coronary heart disease is caused by an obstruction or narrowing of coronary arteries, reducing the blood supply to the heart muscle. The underlying cause of the obstruction is coronary atherosclerosis, but an acute coronary artery occlusion is often caused by the formation of a blood clot in a diseased artery. Terminology related to coronary heart disease is not always consistent, and definitions for various types of coronary heart disease are different.

Estimates of the prevalence of coronary heart disease give a low percentage figure of 1.7 and a high percentage figure of 2.8 percent with the best estimate being 2 percent. An estimated two million new cases occur each year in the United States.

Coronary heart disease primarily affects persons between the ages of 65 and 74. The disease is more prevalent among males than among females, and occurs less often in families with income above $10,000. Working men are affected less often than retired men, and working women less often than housekeeping women. Prevalence is lower for widowed and divorced men than for married men. Prevalence is higher in urban than in rural areas.

No definitive causes of coronary heart disease are known, but several risk factors have been delineated. These risk factors include elevated serum cholesterol level, hypertension, diabetes mellitus, cigarette smoking, heredity, and stress.

The communication and cognitive-intellectual life functions are not affected by heart disease, but mobility may be greatly altered due to the need to limit physical activities, including driving, and sometimes air travel.

Problems in the area of health functioning include extreme tiredness, inability to function sexually, need to maintain a controlled diet, and shortness of breath. The patient must avoid extreme temperatures, and should try to eliminate or reduce risk factors.

Social-attitudinal functioning is altered by the psychological stress of breaking unhealthful habits such as smoking and by diminished self-esteem, inability to return to a former job, depression, fear of future attacks, and, for some, the feminization of the male coronary patient.

It has been estimated that 80 to 90 percent of patients who experience an uncomplicated acute myocardial infarction and survive for one year after the attack, return to work. Three fourths return to their former jobs. Reasons for not returning to work include impending retirement, work which is too physically or emotionally stressful, and a tight job market.

The heart patient's family can help the patient by not "babying" the individual. Some male patients tend to feel like they are losing their masculinity because they cannot help out financially and are limited in their activities.

EMPHYSEMA

Emphysema is a respiratory disorder; a brief description of the disability is given in figure 2-11.

Definition:	Disorder characterized by an increase beyond normal in the size of air spaces distal to the terminal bronchioles with destructive changes in their walls
Prevalence:	0.6 percent of the population
Demographics:	Sex - male Age - over 50 Ethnicity - more among whites Socioeconomic - lower income groups Urban/rural - more in urban areas
Etiology:	Cigarette smoking Air pollution Occupational lung damage Frequent respiratory infections Heredity

Figure 2-11.

A precise definition for emphysema is difficult to determine and is complicated by differences in nomenclature. However, the accepted definition of emphysema is a disorder that is characterized "by an increase beyond the normal in the size of air spaces distal to the terminal bronchioles [of the lung] with destructive changes in their walls." Pulmonary emphysema refers to the more serious, or chronic form of obstructive pulmonary disease. The two main types of pulmonary emphysema are centrilobular emphysema and panobular emphysema. Pulmonary emphysema is characterized by shortness of breath and the inability to properly distribute inhaled air through the lungs.

Estimates of the prevalence of emphysema range from a low percentage figure of 0.5 to a high percentage figure of 0.6 with the best estimate being 0.6 percent. One out of every 14 workers over 45 years of age is disabled by emphysema.

Demographically, sex is a factor in emphysema. Clinically severe emphysema is found 10 times more often in men than in women. White men over the age of 50 are the primary victims. Emphysema is also more prevalent in lower income groups and urban areas.

The major causes of emphysema are cigarette smoking, air pollution, occupation, frequent respiratory infections, and heredity. Some people carry a gene that makes them more susceptible to the disease. The most important causes seem to be cigarette smoking and pollution. Emphysema is found 13 times more often in smokers than in non-smokers.

The only life function not affected by emphysema is communication. The other life functions are all influenced by the disease.

Mobility is altered because of shortness of breath and fatigue upon exertion. The patient experiences difficulties in fine motor control and is sometimes restricted to low altitudes.

Health functions are the most severely affected of the life functions of the emphysema patient. He must learn to deal with the fact that the disease is irreversible and will eventually result in his death. As the disease progresses, the patient's breathing becomes shorter and shorter until dressing or even talking leaves the person breathless. The patient must be very careful of personal environment, smoking behavior, exposure to respiratory infections, and diet. Diet is very important because obesity should be avoided because of the extra strain in breathing involved. The greatest cause of death in emphysema patients is heart dysfunction. The heart is strained in pumping blood when the patient fails to exhale carbon dioxide efficiently. Side effects from drugs are another health complication.

Problems in the cognitive-intellectual life-function area are minimal. In the severe stages of the disease, the patient experiences gradual impairment of mental acuity, memory, visual integration, visual memory, judgment, and fine motor control. The patient may also have trouble in learning new skills.

Problems in the area of social-attitudinal functioning include insomnia, depression, anxiety, and feelings of uselessness and rejection by society.

Emphysema causes workers to limit their activities, but if restricted to non-strenuous work, most patients may continue working. Persons with desk jobs can usually function in their usual occupations for several years until the latter stages of the disease.

Emphysema usually strikes males over 45, and often these men are the main financial support of their families. Consequently, many families will experience definite financial as well as psychological strain. The family members must be loving and understanding to make the disabled individual feel needed. The patient normally limits functioning within the community due to the lack of mobility.

CANCER OF THE COLON/RECTUM

A brief description of the disability of cancer of the colon/rectum follows in figure 2-12.

Definition:	Cancer is characterized by a higher rate of cell growth than normal, failure to maintain the boundaries of normal tissues and organs, resemblance to immature rather than mature tissues, and tendency to spread to parts of the body distant from the original site.
Prevalence:	approximately 0.2 percent of the population
Demographics:	Sex - higher in females Age - usually over 55 years of age Urban/rural - higher in urban areas Geographic - higher in northeast and north central states
Etiology:	Hereditary diseases, environmental factors such as diet

Figure 2-12.

Cancer is characterized by a higher rate of cell growth than normal, failure to maintain the boundaries of normal tissues and organs, resemblance to immature rather than mature tissues, and tendency to spread to parts of the body distant from the original site. There are four major cancer subsites in the colon; they are the ascending colon, transverse colon, descending colon, and sigmoid colon. Colon cancer occurs 41 percent of the time in the sigmoid colon and 34 percent of the time in the ascending colon.

While the prevalence of colon-rectum cancer is quite difficult to measure, data on annual incidence combined with survival rates yields a 0.2 percent figure. This number represents those people now alive who have had this type of cancer and includes both extant and cured cases.

Cancer of the colon/rectum is the second most common cause of cancer deaths. The average life expectancy of patients with untreated colon cancer is 8.4 to 8.7 months and for untreated rectum cancer it is 14.3 to 19.6 months. The average amount of time from the onset of symptoms to treatment is 5.3 months. The length of time from onset to treatment is crucial. Presently, 40 percent of the patients are incurable at the time of treatment.

Eighty percent of colon cancer patients are 55 years old and older, and 58 percent of rectal cancer patients are 65 years old and older. Geographically, the northeast and north central states have higher prevalence rates. This cancer occurs more in economically developed areas where diets are high in carbohydrates and low in fiber content. This fact leads to the conclusion that, while heredity plays some role in the etiology of cancer of the colon/rectum, environmental factors are also important.

The primary life functions affected by cancer of the colon/rectum are health and social-attitudinal functioning. Mobility, communication, and cognitive-intellectual life functions are not significantly affected.

Specific health problems develop before treatment and after treatment. One treatment for cancer of the colon/rectum, a colostomy, can produce a number of health problems: impotency, odor (no control over gas), exhaustion, and general management problems. Health problems that occur prior to treatment include weight loss, anemia, pain, and blood in the stool.

Social-attitudinal functioning is greatly influenced by the disease. The fear of recurrence of the disease may cause considerable anxiety and depression. Additionally, these patients may experience anxiety about social interaction (e.g., because they fear embarrassment due to the odor problem), as well as anxiety about their sexual performance. They may actually withdraw from interpersonal interaction because of their doubts regarding their social and/or sexual adequacy.

KIDNEY DISEASE

Kidney diseases are urogenital disorders; a brief description of the disability is given in figure 2-13.

Definition:	Has no specific definition; classification for a number of diseases that affect the kidneys
Prevalence:	Too complex for analysis. Estimated 2 to 3.3 million have undiagnosed cases. Dialysis patients (an estimated 5,000) suffer renal failure.
Demographics:	Sex - affects females twice as much as males
Etiology:	Many varied causes

Figure 2-13

Kidney disease has no specific definition because there is no specific kidney disease. Kidney disease is a classification for approximately 50 diseases that affect the kidneys. The causes for the diseases are numerous and varied. Infectious diseases of the kidneys are pyelonephritis, focal embolic pyelonephritis, abscess within the kidney, and tuberculosis of the kidney. Non-infectious diseases of the kidneys include glomerulonephritis, nephrotic syndrome, acute interstitial chronic tumors, congenital malformations, renal stones, obstructive disorders, renal artery or vein constriction, blood disorders, acute renal failure due to severe injury or shock, diseases of blood vessels, and metabolic diseases. Renal failure can be caused by disease, injury, or drug intoxication altering the normal kidney functions so that the kidneys fail to maintain the necessary internal balance. Pyelonephritis is the most common form of renal disease, and glomerulonephritis is the second most common form.

Kidney diseases rank fourth among the leading causes of death in the United States. The diseases kill approximately

60,000 Americans annually. Estimates are that 2 to 3.3 million Americans have unrecognized cases of kidney disease. Mortality rate for kidney disease may be increasing. Some reports show a 50 percent increase from what was reported two decades ago.

The only demographic factor that seems to be generally involved in diseases of the kidneys is sex. Generally, kidney diseases affect females twice as often as males.

Kidney diseases cause many health problems that the victim must adjust to. Most of the information available concerns those persons with acute renal failure who require dialysis, which has a variety of deleterious side effects. Some of the problems that might be encountered by the kidney-diseased person are loss of appetite, sleepiness, gastric disorders, hypertension, altered sense of smell, eye problems, seizures, susceptibility to infections, pneumonia, arterial calcification, fever and chills, gout, headache, muscular disorders, gastro-intestinal bleeding, metallic or salty taste, fatigue, cataracts, ulcers, glaucoma, impotence, growth arrest in children, and psychosis. Kidney disease may cause pregnancies to abort spontaneously or to be terminated. Children on dialysis may become impotent or sterile.

Cognitive-intellectual functioning is impaired because of delirious reactions and increased cerebral dysfunction. These types of behavior are often observed during or just after dialysis. The victim of kidney disease may also suffer from a decrease in memory span and attention span and experience difficulty in performing simple integrative tasks.

One the whole, communication functions are not altered greatly by kidney disease. Kidney dialvsis equipment, however, can result in restricted use of the arm used for writing. Vocational participation may be limited by the requirement in some states that a recipient of free dialysis treatment have a low income. Tiredness and the need to avoid strenuous work also limit the employment potential and productivity of dialysis patients.

Functioning as a member of the community is reduced because a person on dialysis may have to limit social activities. The kidney-disease patient often cannot participate in team sports or athletics. However, an average adult with normal motivation and emotional stability can lead a reasonably normal life.

Kidney disease also has a great impact on the patient's family. Often, the patient experiences a decrease or total loss of sexual potency. Treatment causes many additional problems within the home. Home dialysis requires a separate room, and this requirement may cause crowding for the family. Also, the responsibility of administering dialysis treatments and restrictions on social activities may cause family tension.

DIABETES MELLITUS

A brief description of the disability of diabetes follows in figure 2-14.

Definition:	Complex disorder which affects the body's ability to metabolize carbohydrates and interferes with the breakdown of fats and proteins
Prevalence:	1.5 percent of the population
Demographics:	Sex - predominant in females Age - over age 45 Ethnicity - higher in non-whites Socioeconomic - higher in lower income groups Urban/rural - higher in urban areas Geographic - highest in New England, middle Atlantic, and west north central states
Etiology:	Obesity, inheritance, viral infection, trauma, growth hormone

Figure 2-14.

Diabetes mellitus is a complex disorder affecting the body's ability to metabolize carbohydrates and interfering with the breakdown of fats and proteins. Diabetes occurs when the pancreas does not produce enough insulin which regulates the use and storage of glucose. If glucose is not used or stored, the result is an increase in the levels of glucose and the excretion of sugar in the urine. The two major forms of diabetes are juvenile and adult. Juvenile diabetes occurs during the growing years through age 15, and adult diabetes occurs during middle age. Juvenile diabetes may also designate a case of unstable diabetes, and therefore an adult may have juvenile (unstable) diabetes.

Estimates of the prevalence of diabetes mellitus range from 1 to 2 percent of the total United States population with the best estimate being 1.5 percent. Approximately one out of every four persons is a carrier of diabetes. The incidence rate is 72,000 new cases annually. Diabetes ranks as the eighth leading cause of death in the United States.

As for demographics, non-white females over 45 have the highest prevalence of diabetes, but the disease occurs 10 times more often in the over 45 age-group regardless of sex. Non-whites have a higher frequency of diabetes than whites, and lower income families are affected more often than higher income families. The prevalence is greater in urban areas than in rural. Geographically, the highest frequency occurs in the New England, middle Atlantic, and west north central states.

Factors related to the establishment of diabetes include age, sex, obesity, inheritance, viral infection, trauma, and growth hormones. Trauma can aggravate an established case of diabetes. Higher levels of growth hormones which may underlie the development of vascular complications, are common among diabetes.

The health life function is most impaired by diabetes, and these impairments in turn affect the other life functions. Eighty percent of the diabetic population suffers from one or more additional disabling conditions. Twenty-one percent suffers from heart disease, and 17 percent suffers from high blood pressure. Diabetics experience slow and defective healing of wounds. The most common long-term problem of diabetes is retinopathy and its associated visual problems.

Social-attitudinal functioning is altered by feelings of anxiety, isolation, self-destructiveness (e.g., going off the diet), and depression.

Mobility functioning is often impaired, not necessarily by diabetes but by accompanying disabilities. Six percent of the diabetic population is confined to the home or unable to move without difficulty.

While cognitive-intellectual functioning is not impaired by diabetes, repeated attacks of hypoglycemia or coma may cause brain damage that may cause altered behavior or personality. Diabetics on the whole, however, do not appear to suffer from any serious mental defects.

Membership in the labor force is not a major problem for diabetics. Records show that their work performance is of high quality, and their absentee record is favorable. Diabetics are capable of functioning well in management positions as well as those requiring manual labor. They generally have relatively little difficulty functioning as members of the community unless they are severely affected.

HEARING IMPAIRMENT

Hearing impairment is a sense organ disorder; a brief description of the disability is given in figure 2-15.

Definition:	Deviation in hearing sufficient to impair normal aural-oral communication
Prevalence:	6.6 percent of the population
Demographics:	Sex - more common in males Age - occurs most often between ages 6 and 24 and over age 65 Ethnicity - higher rate among whites Socioeconomic - higher rate in lower class Urban/rural - more common in rural areas
Etiology:	Injury, illness, heredity, or a combination of these

Figure 2-15.

The best definition for hearing impairment is Lloyd's (1968) operational or functional definition.

> "Hearing impairment" refers to a deviation in hearing sufficient to impair normal aural-oral communication. The degree of hearing impairment is the result of degree of deviation in hearing (sensitivity and/or other auditory abilities) interacting with a number of other factors, e.g., age of onset, age of detection and intervention, duration, type of pathology and related factors, use of amplification, habilitating programming, family factors and resilience or compensatory (or adaptive) abilities.

Hearing impairment may be classified from slight to extreme, with deafness being extreme impairment in both ears. Statistics reported may vary depending on the level of hearing impairment included. At the very least, the distinction between hearing impairment and deafness must be kept in mind while reviewing these statistics.

The prevalence of hearing impairment ranges from a low figure percentage of 5.4 to a high figure percentage of 7.3, with the best estimate being 6.6 percent. Hearing impairment is the single most prevalent chronic physical disability in the United States. The available statistics for deafness show an increase in its prevalence rate.

Age, sex, ethnicity, socioeconomic status, and education are important demographic factors. The 6 to 24 age group shows a greater hearing impairment rate than the 25 to 44 year-old group. The highest rate is in the 65 and over category. Hearing impairment also occurs more often among whites and among males. Socioeconomic studies show that as a family's income and education increases, the prevalence of binaural hearing impairment decreases. Studies of the education factor demonstrate that hearing impaired children are several years behind normal hearing children. Less than half of all deaf persons reaching adulthood have finished high school, and 28 percent have only an eighth grade education. It should be noted here that deafness is only one (the most extreme) aspect of hearing impairment.

The causes of deafness are varied and include injury, illness, heredity, or a combination of these factors. Genetic components cause one-third of the deaf cases, post-traumatic or post-infectual factors cause another third of the cases, and unknown factors account for the rest. Three-fourths of the prevocationally deaf population lose their hearing before they are 3 years-old. Over half lose their hearing before they reach the age of 1. Twelve percent become deaf at or after 6 years of age. Hearing impairment in general, however, is often a concomitant of old age.

The most impaired life function for the hearing impaired is communication. Some studies have found deaf persons to display low reading comprehension or functional illiteracy. Poor or limited speaking ability is not uncommon, and the deaf person may also be unwilling to use verbal speech in interpersonal transactions.

Studies of impairment in social-attitudinal functioning have yielded inconclusive and conflicting results. Deaf persons are often found to be emotionally immature sometimes with neurotic tendencies. In general, they appear more poorly adjusted than the non-deaf. This is possibly a result of the fact that language is both a significant factor in the development and facilitation of social interaction and the means by which information is internalized and stored.

Mobility functioning is affected only slightly. The areas that may be affected are motor speed, balance, and locomotor coordination.

One-third of the hearing impaired population is handicapped in the area of health functioning. Deaf persons often experience asthma and impaired vision. They may receive inadequate medical care because of their inability to communicate their symptoms.

Cognitive-intellectual functioning is affected very little, although academic performance may suffer. Deaf persons possess average mental capacities. They may or may not have the same capacity for abstract and conceptual thinking as persons with normal hearing abilities.

Hearing-impaired persons are better represented in the labor force than other disabled groups. Their rate of employment is higher than the employment for the general population. This is particularly true of non-white deaf persons. However, studies show that many deaf persons are underemployed. One possible source of this underemployment appears to be employer attitudes toward the deaf. Deaf persons are employed in all occupations, but machine operators make up the largest group, craftsmen the second largest group, and professional and technical employees the next largest group. The deaf have a very high rehabilitation rate. The single largest employer of the deaf in the United States is the federal government.

Studies indicate a deaf child of hearing parents faces more intrafamilial adjustment problems than a deaf child of deaf parents. Since most deaf people have hearing parents, their families often lack personal experience with the handicap. Many times these parents refuse to acknowledge the impairment and/or react negatively to it. While deaf people are capable of establishing effective personal relationships and are not lacking in socialization skills, one report found that one-third of the deaf population felt that hearing people have negative feelings toward them. Further, other research found hearing impaired children to be chosen less frequently as playmates.

VISUAL IMPAIRMENT

Visual impairment is a sense organ disorder; a brief description of the disability is given in figure 2-16.

Definition:	Central visual acuity of 20/200 or less in the better eye with the use of a corrective lens
Prevalence:	3 percent of the United States population; the blind comprise approximately 0.4% of the population
Demographics:	Age - over 65 Socioeconomic - less blindness in higher classes Ethnicity - more common among minority groups
Etiology:	Senile cataract, glaucoma, diabetes mellitus, vascular diseases, prenatal influences

Figure 2-16.

The disabilities subsumed under the rubic "visual impairment" include not only total blindness and "legal" blindness but also partial sightedness which significantly interferes with normal functioning. The most commonly used administrative definition of blindness, as cited in the Social Security Act of 1967 is the following.

> An individual shall be considered to be blind if he has a central visual acuity of 20/200 or less in the better eye with the use of a corrective lens. An eye which is accompanied by a limitation in the fields of vision such that the widest diameter of the visual field subtends an angle no greater than 20 degrees shall be considered for purposes of the first sentence of this subsection as having central visual acuity of 20/200 or less.

The partially sighted are generally defined as persons with a visual acuity greater than 20/200 but not greater than 20/70 in the better eye after correction.

These definitions, while useful for administrative purposes, are not always useful in ensuring the delivery of equitable services to meet the life-function needs of the visually handicapped. Measures of visual acuity on which these definitions are based are almost always determined by a Snellen Chart which measures only distance vision, and examinations are frequently made under varying conditions by persons with varying degrees of expertise.

Because of differences of opinion among researchers concerning the inclusion of the partially sighted in surveys designed to determine the incidence and prevalence of "blindness," estimates of the extent of visual disability within American society vary widely. The National Society for the Prevention of Blindness (NSPB), which uses the "legal" definition of blindness and examination data, in 1960 estimated the prevalence of blindness at 2.14 per 1000 population. The National Health Survey of the United States Public Health Service, however, using a definition of blindness (later amended to "severely visually impaired") as the inability to read ordinary newsprint even with the aid of glasses, obtained an estimated prevalence rate of 5.6 per 1000 population, based on a nationwide household survey.

Incidence figures are equally tentative because cases of blindness are not usually reported as they occur but as they come to the attention of an eye examiner. Nonetheless, the NSPB arrived at an estimate in 1960 of 16.9 new cases reported each year per 100,000 population. The best current estimates are that both incidence and prevalence of visual disability will increase as the life span of individuals is increased. A 30-percent increase in the total population of blind persons is projected for the period 1969-1985.

Among the significant demographic data is the fact that nearly one-half of the legally blind population is 65 years of age or older (NSPB, 1962). Also, the prevalence rate for visual disability varies significantly with family income.

For families with incomes under $2000 per year, the rate of blindness is 12.3 per 1000 persons, compared to 1.59 for families with incomes over $7000. Finally, visual impairment frequently occurs in combination with other disabiliites. Estimates vary from as high as 50 percent in a 1968 survey in California to approximately 20 percent of blind school children who are multiply handicapped.

The leading causes of blindness are senile cataract (approximately 15.6 percent), glaucoma (approximately 15 percent), diabetes (approximately 11.2 percent), vascular diseases (approximately 7.6 percent), and prenatal influences (approximately 16.7 percent). These data further substantiate prevalence of multiple disabilities among the visually impaired.

The life-function needs arising from visual impairment are many. The mobility life function is perhaps the most significant area of restriction for the visually handicapped. Only about 30 percent of the visually impaired are as mobile as they could be, despite the availability of mobility training. The fact that only about 15 percent of all blind persons have availed themselves of such training reflects the need for more programs and more publicity for existing programs. Blind persons are particularly wary of physical harm from such obstacles as open manhole covers, utility poles, street crossings, platform edges, etc. Such outdoor obstacles present the main problems to blind persons because auditory cues for navigation are frequently drowned out. A second major impairment in mobility centers on the lack of physical coordination that blind persons experience because they are unable to learn motor skills by imitation.

Within the health life function, blind persons experience certain chronic diseases with more frequency than does the general population. Perhaps the most significant problem of blind persons within the health life function, though, is that 22.9 percent of the visually impaired also have hearing difficulties.

Predictably, blind persons have difficulties in the communications area of reading, but they also have significant problems in a number of other communications functions. A very high percentage, estimated at approximately 49 percent of blind children, for example, have speech problems, and there are estimated to be approximately 4000 to 5000 persons in the United States who are both deaf and blind. The reading problems of the visually impaired arise from the fact that only about 25 percent of all blind persons can read Braille, and only about 4 percent of the blind adults use it to any extent.

Cognitive-intellectual functioning of the visually impaired is difficult to estimate because of the difficulty of adapting standard intelligence tests to the special needs of the blind. Nonetheless, on IQ tests adapted for the blind, blind children tended to cluster more in the inferior and superior ranges than in the average ranges. Also congenitally blind children use abstract concepts less than do sighted children. The multiple-disability factor also enters into the cognitive-intellectual functioning of the blind, with approximately 15 percent of students at institutions for the blind being mentally retarded, a phenomenon which may be partially accounted for by the inferior environment in which many of the blind grow up.

In social-attitudinal functioning, the blind have been found to differ from sighted persons in the following ways. The blind tend to be more anxious, more docile, less active, more rigid, more "intropunitive," more inclined to be neurotic, and less adequately adjusted sexually.

The impact of these life-function limitations upon the ability of the visually handicapped to function as members of the labor force seems to depend primarily on the individual. Although emotional immaturity and low self-concept may interfere with the ability of blind persons to attain and hold satisfactory employment, experts state that the blind can participate in almost any occupation. Except for cases in which blindness is associated with mental retardation and other disabilities, the blind person is vocationally limited only by his general education, specific vocational training, and psychological adaption to or acceptance of disability.

SUMMARY STATISTICS

Table 2-1 summarizes "high," "low," and "best-estimate" prevalence figures for all 14 representative disabilities. Table 2-2 summarizes the demographic distributions of the disabilities, and table 2-3 summarizes etiology. In all cases, these summaries are based on analysis of what seems to be the major patterns in the data.

Tables 2-1 through 2-3 present on a common grid the statistical and summary information gathered about the 14 representative disabilities. The tables show the range of disparity as well as the commonalities in disability-oriented information from various sources. They also show the necessity for consideration of disability and rehabilitation on a life-function, rather than a specific-disability basis.

TABLE 2-1

ESTIMATES OF THE PREVALENCE OF FOURTEEN REPRESENTATIVE DISABILITIES

Disability	Low Figure	High Figure	Best Estimate	Comments
Stroke	1.8	1.1	0.8	Little information
Spinal Cord Injury	0.06	0.08	0.08	Head counts
Cerebral Palsy	0.1	0.4	0.3	Fairly stable rates
Epilepsy	0.2	1.9	0.5	1-2% including undetected
Mental Retardation	1.0	3.0	2.0	1% for adults, 3% for school-aged
Schizophrenia	0.1	0.4	0.3	Fairly stable rates
Rheumatoid Arthritis	1.0	6.7	1.5	Confused with other forms. Arthritis Foundation says 1 or 2%
Coronary Heart Disease	1.7	2.8	2.0	Very rough due to differences in terms
Emphysema	0.5	0.6	0.6	Little information
Colon/Rectum Cancer	-	-	0.2	Fairly stable rates
Kidney Disease	-	-	-	Too complex for analysis. Estimated 2-3.3 million have undiagnosed cases. 5,000 on dialysis. Figures for some diseases available.
Diabetes Mellitus	1.0	2.0	1.5	Known cases only; almost doubles if estimate unknown
Hearing impairment	5.4	7.3	6.6	Deaf estimates
prevocationally deaf	0.1	0.2	0.2	More stable
Visual impairment	1.2	4.8	3.0	Blind estimates
legally blind or blind	0.1	0.6	0.4	More stable

TABLE 2-2
DEMOGRAPHIC DISTRIBUTIONS OF CASE STUDY DISABILITIES

Disability Group	Age	Sex	Ethnicity	SES[1]	Urban/Rural
Spinal Cord Injury	15-25	Male	Minority	No Trend	No Trend
Stroke	65 and over	No Trend	Minority	No Trend	Urban
Cerebral Palsy	0-18 years	Male	White	?	?
Epilepsy	0-18	Male	Minority	?	Urban
Mental Retardation	0-18	Male	Minority	Low	Urban
Schizophrenia	25-44	No Trend	Minority	Low	Urban
Rheumatoid Arthritis	over 40	Female	No Trend	No Trend	No Trend
Coronary Heart Disease	65 and over	Male	No Trend	Low	Urban
Emphysema	over 50	Male	White	Low	Urban
Colon/Rectum Cancer	over 55	Female	No Trend	?	Urban
Kidney Disease	?	Female	No Trend	?	?
Diabetes Mellitus	40-60	Female	Minority	Low	Urban
Hearing Impairment	65 and over	Male	White	Low	Rural
Visual Impairment	65 and over	?	Minority	Low	No Trend

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[1] Socioeconomic status

TABLE 2-3
ETIOLOGICAL CATEGORY

Table Format
  Disability:
    Etiological Categories:

SPINAL CORD INJURY:
  Disease: Spinal tumors
  Injury or Trauma: 65-80%; vehicles, sports, falls, industrial accidents, knife, bomb, and gunshot wounds
  Congenital: Spina bifida; meningocele; myelomeningocele

STROKE:
  Genetic: Tendency may be inherited
  Metabolic Dysfunction: Hypercholesteremia; diabetes mellitus
  Drugs/Toxic Agents: Oral contraceptives; cigarette smoking
  Diet: Obesity
  Disease: Cerebral thrombosis (64%); cerebral embolism (17%); heart disease; hypertension; atherosclerosis
  Other/Unknown: 10%
  Injury or Trauma: Compression; spasm; cerebral hemorrhage
  Congenital: Congenital defect in blood vessel; congenital aneurysms

CEREBRAL PALSY:
  Genetic: Familial athetosis; congenital tremors; spastic paraplegia; atonic diplegias; familial rigidity
  Drugs/Toxic Agents: Blood type incompatibility (Rh); toxemia
  Disease: Tuberous sclerosis; demyelinating diseases; maternal infections; kernicterus; meningitis; encephalitis; tay sach's disease
  Injury or Trauma: Anoxia (pre-perinatal); cerebral hemorrhage; gonadal irradiation due to X-ray; prematurity; prolonged labor; abnormal birth; sudden pressure change (i.e., ceasarian)

EPILEPSY:
  Genetic: Inherited
  Metabolic Dysfunction: Hypoglycemia; hypocalcemia; vitamin B6 deficiency; acute intermittent porphyria; phenylketonuria
  Drugs/Toxic Agents: Intoxication - convulsant drugs, lead, sudden withdrawal by chronic alcoholics, overdoses of stimulants and depressants; maternal German measles; toxemia
  Disease: Brain tumors; cerebral infections - encephalitis; meningitis; febrile convulsions; trichinosis; sturge-weber

TABLE 2-3 (CONTINUED)
ETIOLOGICAL CATEGORY

syndrome; Alzheimer's disease; toxoplasms; cytomegalic includion disease; Tay Sach's disease; Vascular disease
Other/Unknown: Improper implantation or premature separation of the placenta may interfere with fetal blood supply and cause brain damage
Injury or Trauma: Head injuries; subdural hematoma; anoxia
Congenital: Congenital syphillis

MENTAL RETARDATION:
Genetic: Chromosomal abnormalities; (Down's Syndrome: Klinefelter's Syndrome)
Metabolic Dysfunction: Phenylketonuria; galactosema; cretinism; Hurler's disease; Wilson's disease; maternal diabetes
Drugs/Toxic Agents: Rh incompatibility; intoxication - lead, arsenic, carbon monoxide
Psychological: Extreme maternal anxiety
Age: Down's Syndrome more likely as maternal age increases
Diet: Maternal malnutrition during pregnancy
Disease: Maternal infections (rubella); tuberous sclerosis; neurofibromatosis; brain tumors; meningitis; encephalitis; Heller's disease; Tay Sach's disease
Other/Unknown: Cultural-social deprivation (all known organic causes account for approximately 5% of the incidence of retardation; cultural-social or unknown causes account for 95%)
Injury or Trauma: Premature birth; low birth weight; perinatal anoxia; brain injuries due to accident or trauma
Congenital: Congenital syphillis; congenital abnormalities of skull and brain - microcephaly; hydrocephaly; macrocephaly; hyperterlorism; craniostenosis; anencephaly; agyria

SCHIZOPHRENIA:
Genetic: (Hypothesized) genetic predisposition; inherited defect in an enzyme which oxidizes adrenaline
Metabolic Dysfunction: (Hypothesized) errors in neuramic acid and tryptophane metabolism; chemical factors in carbohydrate metabolism; defects in neural transmitters such as serotonin, adrenaline, acetylcholine
Drugs/Toxic Agents: (Hypothesized) toxicity of body fluids
Psychological: (Hypothesized) stress; emotional disorder; "double bind" (acceptance and rejection); irrationality; anxiety; social isolation
Diet: (Hypothesized) poor nutrition before, during and after birth
Other/Unknown: (Hypothesized) probably a combination of genetic pre-disposition and environmental factors; defect in neural synapses; attentional deficit
Congential: (Hypothesized) defective embryogenesis

TABLE 2-3 (CONTINUED)
ETIOLOGICAL CATEOGRY

RHEUMATOID ARTHRITIS:

Genetic: Inherited

Metabolic Dysfunction: Auto-immune systems altered; more common in females (ratio 3:1 or 3:2)

Psychological: More common in neurotic personality types (hypochondria, depression, hysteria) may be precipitated by abrupt emotional upheaval

Age: Incidence increases with age;most common between 30-50 years old

Disease. Infecting agents; malignancy (R.A. thought by some to be a malignancy): Still's disease

Injury or Trauma: May be caused by manual labor occupations (Farmers, auto workers, etc.)

CORONARY HEART DISEASE:

Genetic: Inherited CHD (both sexes)

Metabolic Dysfunction: Elevated serum lipids (especially cholesterol): males more prone than females - female incidence approaches male incidence after menopause; diabetes mellitus

Drug/Toxic Agents: Cigarette smoking (#1 risk factor)

Psychological: Stress

Age: Incidence of CHD increases with age

Diet: Obesity; diets high in sugar and animal fat

Disease: Hypertension

Other/Unknown: Lack of exercise

EMPHSEMA:

Genetic: Deficiency in serum alpha-antitypoin

Drugs/Toxic Agents: Cigarette smoking (#1 risk factor); air pollution)

Disease: Respiratory infections

COLON/RECTUM CANCER:

Genetic: Inherited diseases (see Diseases)

Age: Incidence increases with age

Diet: #1 risk factor - low fiber and highly refined carbohydrates

Disease: Gardner's syndrome; familial polyposes; ulcerative colitis; villous adenoma; Crohn's Disease; globulin deficiency

KIDNEY DISEASES:

Nephritis:

Genetic: Partially sex-linked

Drugs/Toxic Agents: Allergy to drugs(Phenindione and sulphonamides) and analgesics (phenacetin)

Nehprosis:

Drugs/Toxic Agents: Reactions to drugs and allergens

TABLE 2-3 (CONTINUED)
ETIOLOGICAL CATEGORY

Nephrotic Syndrome:
- Metabolic Dysfunction: Diffuse and nodular diabetic glomerulesclerosis, amyloidosis, myxedema
- Disease: Systemic diseases; primary renal parenchymal disease; glomerular disease
- Other/Unknown: Foreign bodies such as renal calculi and catheters
- Injury or Trauma: Urinary tract obstruction including pregnancy and prostate enlargement; renal artery obstruction
- Congenital: Congenital urinary tract obstruction; congenital renal dysplasias

Pyelonephritis:
- Metabolic Dysfunction: Diabetes mellitus
- Disease: Microorganisms entering kidney through bloodstream or urinary tract; nephrocarcinosis; polycystic disease; ischalmic disease of the kidney; nephrosclerosis; intercapillary glomerulosclerosis; systemic disorders of host resistance; hypoplasia

Glomerulonephritis:
- Disease: Streptococceal infection; usually preceeded by an upper respiratory hercolytic streptococcal infection

Other Kidney and Urinary Disorders:
- Genetic: Cystic kidney diseases - hereditary defects; cyctinuria - 2 forms, mendelian recessive and incompletely recessive; secondary hypertension - amyloidosis; renal carcinoma - hereditary
- Metabolic Dysfunction: Kidney stones - primary hyperparathyroidism - excess parathormone mobilizes skeletal calcium; urinary tract stones - may be associated with metabolic diseases; cystic kidney diseases - inborn errors of metabolism allow the accumulation of a nephrotoxic substance which produces secondary renal damage; secondary hypertension - endocrine mechanisms; polycystic kidneys; renal carcinoma - influence of sex hormones
- Drugs/Toxic Agents: Secondary hypertension - toxemia of pregnancy; benign neoplasm - ingestion of dye substances; uremia drug intoxication (especially barbituates)
- Disease: Kidney stones - urinary tract infections; urinary renal tuberculosis - arises from an infection of the lungs of hilar lymph nodes; cystinuria - infections; secondary hypertension - glomerulonephritis; pyelonephritis, renal ischemia; periateritis nodosa; renal carcinoma - infectious agents; benign neoplasm - parasitism; renal infarction - atheroma; emoblism; chronic renal failure - disease of the glomeruli and vasculature

TABLE 2-3 (CONTINUED)
ETIOLOGICAL CATEGORY

Other/Unknown: Kidney stones - dehydration; cystinuria - malformations in renal tract structure and inadequate fluid intake; secondary hypertension - renal artery obstruction; neurogenic mechanisms; acute renal failure - asphyxia; dehydration; poor renal perfusion; due to hypovalemia; gastro-intestional upset

Injury or Trauma: Renal carcinoma - physical agents; uremia - injury; hypotension during anesthesia; severe burns causing fluid shift; renal infraction - blocked arterial blood supply; arterial injury or spasm; acute renal failure - injury

Congenital: Congenital anomalies of size, number, development, location; renal carcinoma - embryonal cells trapped in kidney; chronic renal failure - developmental anomalies; acute renal failure - congenital lesions

DIABETES MELLITUS:

Metabolic Dysfunction: Under 40 years of age, more common in men - in 50's and 60's (age) more common in women; growth hormone - higher levels in diabetes

Age: Incidence increases with age

Diet: Obesity

Disease: Viral infection

HEARING IMPAIRMENT:

Genetic: 33%

Drugs/Toxic Agents: Prenatal toxemia; prenatal - maternal rubella

Age: Presbycusis

Disease: Scarlet fever; infections; meningitis; chronic otitis; tympanosclerosis; kernicterus

Other/Unknown: 33%

Injury or Trauma: Premature birth; noise induced; prenatal anoxia

VISUAL IMPAIRMENT:

Metabolic Dysfunction: Diabetes; albinism

Disease: Arteriosclerosis; hypertension; nephritis; retinal degeneration; senile cataracts (15.6%); glaucoma (13.5%)

Congenital: Cataracts; prenatal coloboma; congenital glaucoma

CHAPTER 3
DISABILITY AS LIFE-FUNCTION IMPAIRMENT OR LIMITATION

For policies to be effective, they must meet the needs of the population served, and those needs must therefore be identified as concretely and specifically as possible For policies to be efficient, they must be formulated to meet the needs of as broad a spectrum of the target population as possible. In most information available from past research, however, the needs of the disabled population as a whole have been described in fragmented and sometimes highly abstract and ambiguous terms.

The problems in accurately assessing the needs of the disabled are discussed in Appendix A of this report. These problems interfere with identifying (defining and censusing) both the disabled population in general and the individual populations within the 14 representative disability groups. Beyond these problems, however, lies a greater and more salient difficulty in identifying the specific needs which may be met by public policy. Most of the literature of disability is medical literature which describes the problems of specific disabilities in terms of etiology (cause), symptoms, locus of organic involvement, and sometimes, though not always, descriptions of the effect of an impairment upon organic functioning. Although such descriptions are useful for the formulation of certain types of policy--for example funding to basic medical research--they are of limited use in the formulation of policy having more direct effect upon disabled individuals and groups.

Research sources, in general, have also failed to provide in-depth information about how a medically-defined impairment affects a person's ability to function in life or how environmental influences determine the extent to which an impairment actually results in a handicap in functioning.

This study has been based on the concept of life functions--functions which human beings, disabled or not, carry out. A disabled person has, therefore, been defined as a person who has a set of limitations in major competencies and activities of life. However, a person's ability to succeed as a member of the community and as a member of the labor force are not only products of his functional capacities but are also products of environmental influences. Employers' attitudes, architectural barriers, and treatment and training programs, for example, form such an environment. The interaction of disability, impairment, handicap, and environment is depicted in figure 3-1.

The concept of an analysis of the needs of the disabled according to life-functions was devised to provide a more comprehensive, more specific description of needs which pervade the entire spectrum of human disability. This classification scheme not only enables analysis of needs on several levels from the most abstract to the most specific, but it also provides a framework in which needs common to two or more disability groups may be identified, analyzed, and addressed more efficiently and effectively in public policy.

Further, the concept of analysis of life-function needs as a description of the problem of disability within American society is an aid to policymaking by the fact that it describes needs of the disabled in terms which can also reference needs of nondisabled persons. In areas in which mobility needs, for example, of the disabled can be met by slight revision of policies which support mobility needs of the nondisabled, policies may be formulated to be more effective.

LIFE FUNCTIONS NEEDS

Life function needs are deficits, either observable in the behavior of the disabled or reported by them, in the ability to establish or maintain functional competence in any of the following five broad categories.

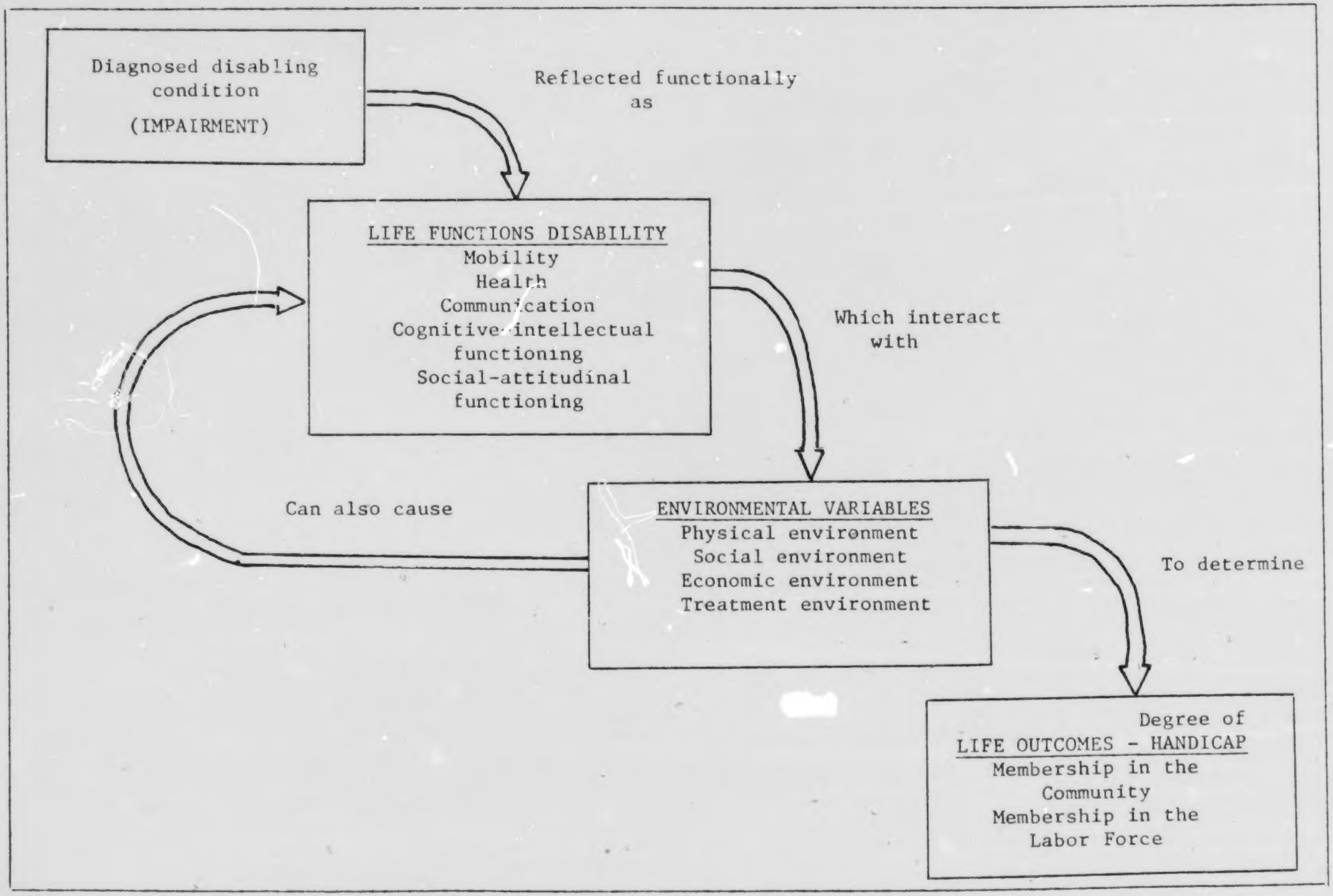

Diagnosed disabling condition
(IMPAIRMENT)
Reflected functionally as
LIFE FUNCTIONS DISABILITY
Mobility
Health
Communication
Cognitive-intellectual functioning
Social-attitudinal functioning
Which interact with
Can also cause
ENVIRONMENTAL VARIABLES
Physical environment
Social environment
Economic environment
Treatment environment
To determine
Degree of
LIFE OUTCOMES - HANDICAP
Membership in the Community
Membership in the Labor Force

Figure 3-1. Relationships among impairment, disability, and handicap

1) Health (being able to have the physical well-being associated with proper physiological functioning).
2) Mobility (being able to operate on and negotiate the physical environment).
3) Communication (being able to send and receive communications with other human beings and the environment).
4) Cognitive-intellectual processes (being able to cognitively interpret events, to learn, and to apply learning).
5) Social-attitudinal processes (being able to regard oneself positively and to interact successfully with others).

A very general description of some of the types of limitations experienced by disabled persons within each of these life-function areas is given in table 3-1.

TABLE 3-1

TYPES OF LIFE-FUNCTION LIMITATIONS EXPERIENCED BY DISABLED PERSONS

HEALTH LIMITATIONS:

1. Difficulty in simply staying alive or avoiding pain.
2. Difficulty in maintaining a lifestyle focused on avoidance of risk to physiological well-being.

MOBILITY LIMITATIONS:

1. Difficulty using manual skills to manipulate objects or devices.
2. Difficulty locomoting within a living or working environment.
3. Difficulty moving from place to place within or outside the community.

COMMUNICATION LIMITATIONS: (Resulting either from impairment in the senses or mechanisms of communication or from deviant content of communication, as in mental illness.)

1. Difficulty in sending messages to other persons.
2. Difficulty in receiving messages from other persons or the environment.

COGNITIVE-INTELLECTUAL LIMITATIONS: (Resulting from either congenital or environmental factors and causing either slow learning or distorted thoughts and perceptions.)

1. Difficulty intellectually manipulating symbols and objects.
2. Difficulty in acquiring new cognitions or behaviors.
3. Difficulty transferring learning to new situations.

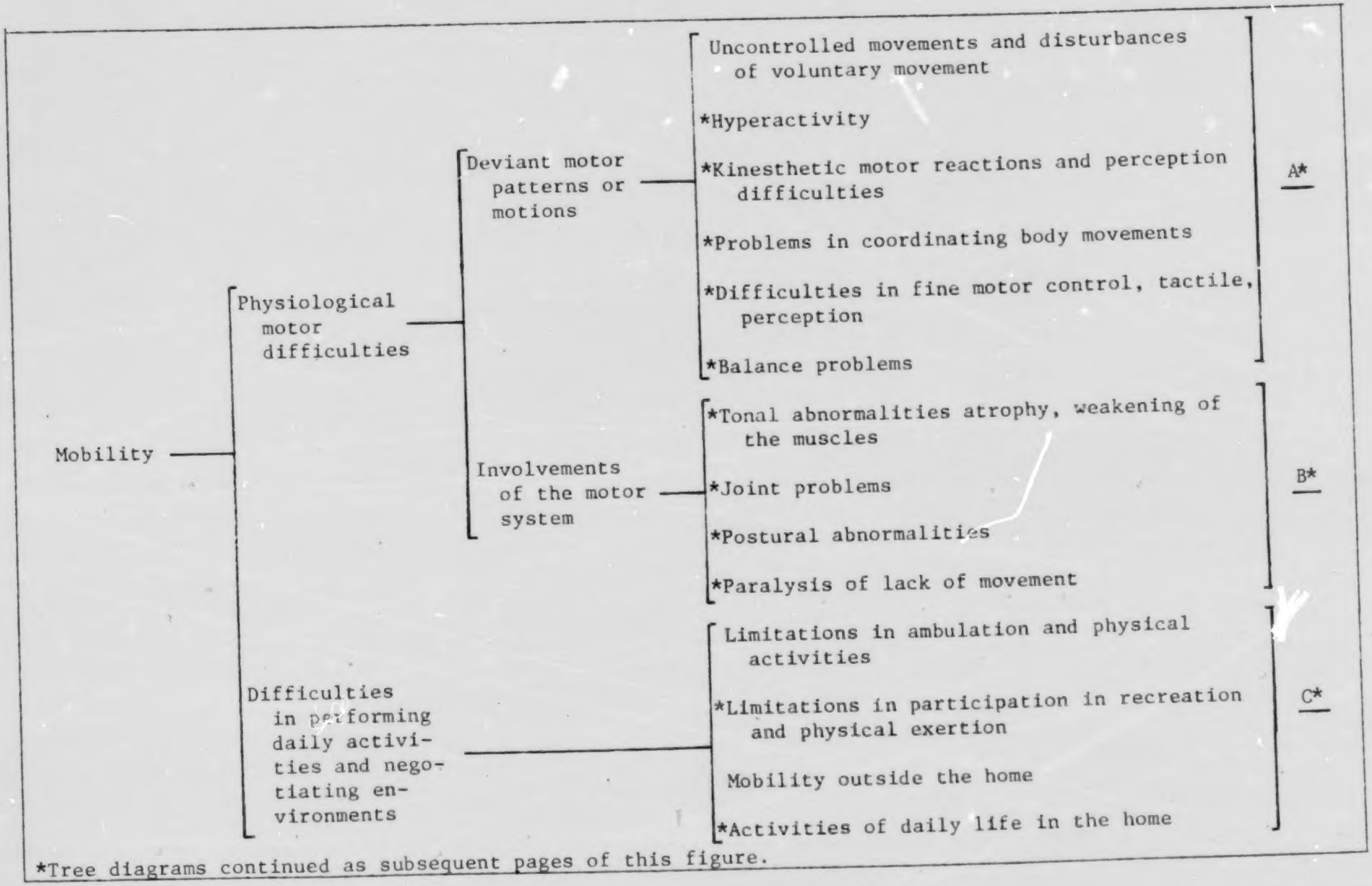
TABLE 3-1 (CONTINUED)
TYPES OF LIFE-FUNCTION LIMITATIONS EXPERIENCED BY DISABLED PERSONS

SOCIAL-ATTITUDINAL LIMITATIONS: (Resulting from either societal intolerance or misconceptions or within the individual himself.)

1. Difficulty in accepting oneself and one's abilities.
2. Difficulty in relating to other people.
3. Difficulty in becoming motivated to improve oneself as a member of the labor force or of the community.

LIFE-FUNCTIONS TREES

The life-function needs of disabled persons are highly complex. They are difficult to conceptualize systematically in a form which encompasses the needs of a variety of disability groups, especially in light of the varying degrees of abstractness and specificity in which these needs are expressed in research sources. Therefore, this project has developed life-function needs "tree diagrams" for each of the five life-functions to provide a conceptual framework. The trees are classifications of all needs reflected in research sources dealing with the 14 representative disabilities. These tree diagrams are included as figures 3-2 through 3-6 in this chapter. The far left-hand sides of the figures represent the most abstract (or general) descriptions of life-function needs, and each level of the diagrams to the right represents an increasingly concrete and specific description of the need. The most specific needs statements available are on the far right-hand side of each diagram. The needs statements in these diagrams are included without reference to any specific disability groups and are intended to serve as comprehensive descriptions of the types of needs encountered by the disabled population as a whole within a particular life-function area.


Mobility
Physiological motor difficulties
Deviant motor patterns or motions
Uncontrolled movements and disturbances of voluntary movement
*Hyperactivity
*Kinesthetic motor reactions and perception difficulties
*Problems in coordinating body movements
*Difficulties in fine motor control, tactile, perception
*Balance problems
A*
Involvements of the motor system
*Tonal abnormalities atrophy, weakening of the muscles
*Joint problems
*Postural abnormalities
*Paralysis of lack of movement
B*
Difficulties in performing daily activities and negotiating environments
Limitations in ambulation and physical activities
*Limitations in participation in recreation and physical exertion
Mobility outside the home
*Activities of daily life in the home
C*

*Tree diagrams continued as subsequent pages of this figure.

Figure 3-2. Tree diagram for mobility needs

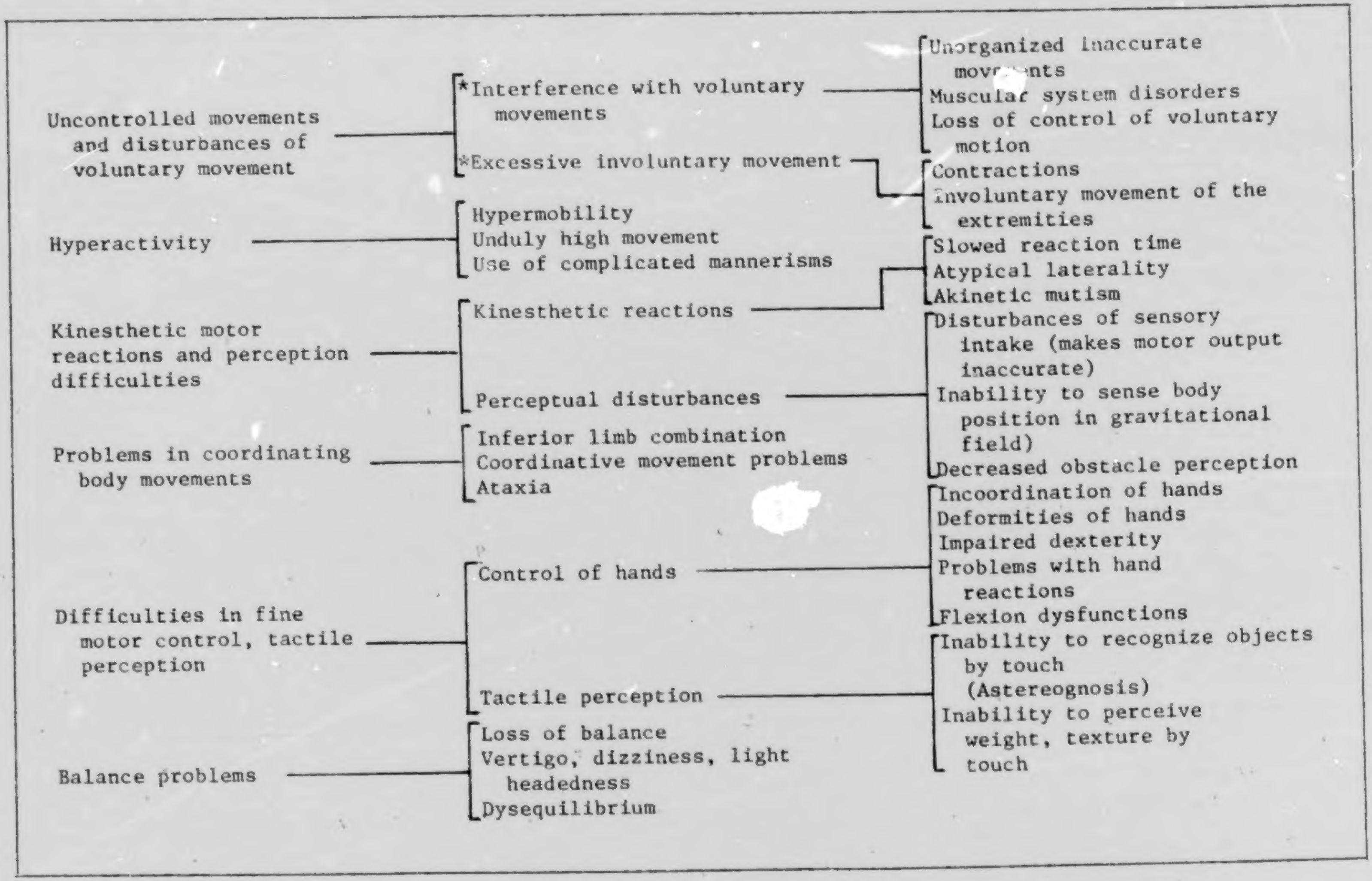

Uncontrolled movements and disturbances of voluntary movement
*Interference with voluntary movements
*Excessive involuntary movement
Unorganized inaccurate movements
Muscular system disorders
Loss of control of voluntary motion
Contractions
Involuntary movement of the extremities
Hyperactivity
Hypermobility
Unduly high movement
Use of complicated mannerisms
Slowed reaction time
Atypical laterality
Akinetic mutism
Kinesthetic motor reactions and perception difficulties
Kinesthetic reactions
Perceptual disturbances
Disturbances of sensory intake (makes motor output inaccurate)
Inability to sense body position in gravitational field)
Decreased obstacle perception
Problems in coordinating body movements
Inferior limb combination
Coordinative movement problems
Ataxia
Incoordination of hands
Deformities of hands
Impaired dexterity
Problems with hand reactions
Flexion dysfunctions
Difficulties in fine motor control, tactile perception
Control of hands
Tactile perception
Inability to recognize objects by touch (Astereognosis)
Inability to perceive weight, texture by touch
Balance problems
Loss of balance
Vertigo, dizziness, light headedness
Dysequilibrium

Figure 3-2 (continued-A). Tree diagram for mobility needs

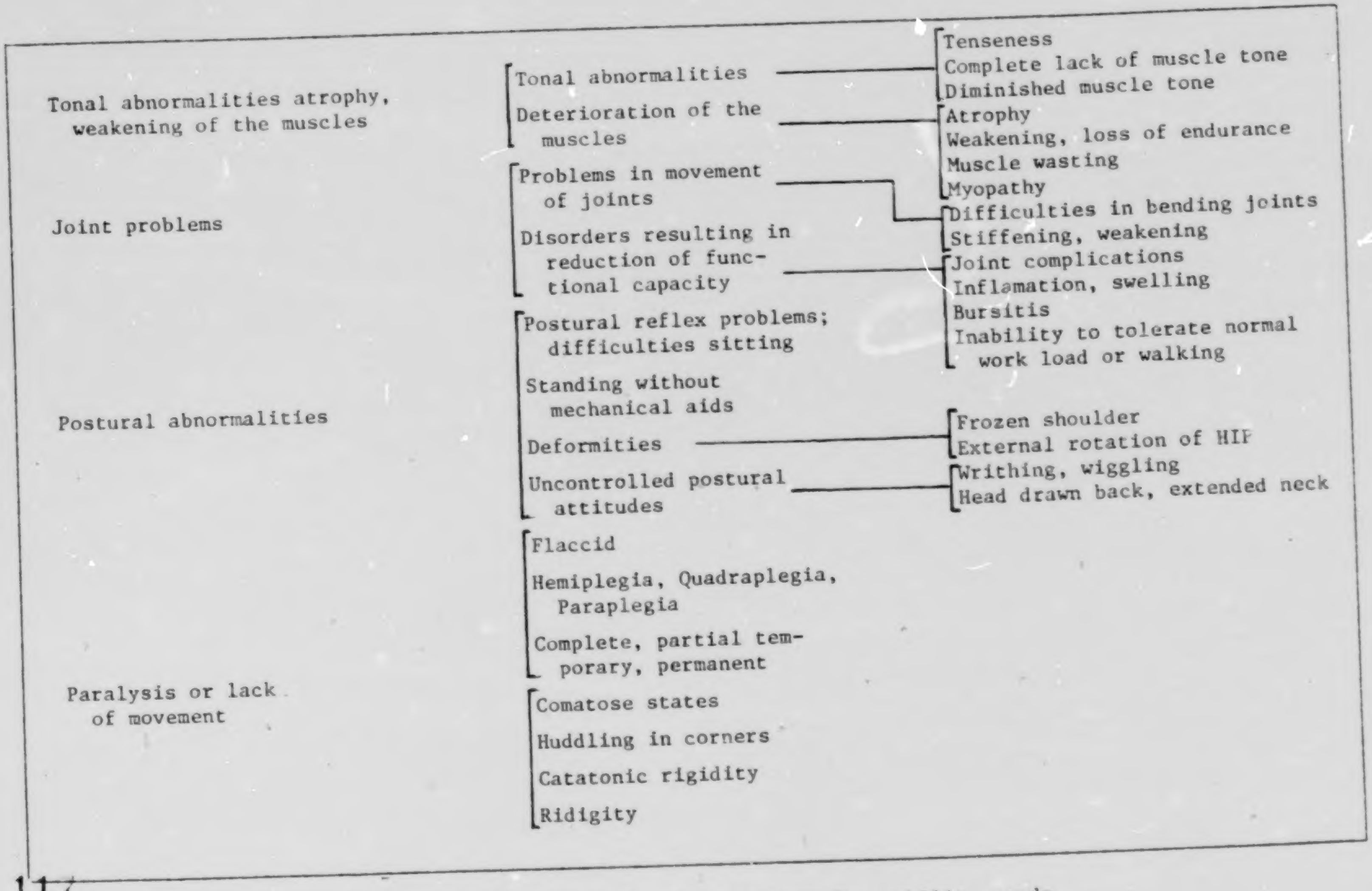

Tonal abnormalities atrophy, weakening of the muscles
Tonal abnormalities
Deterioration of the muscles
Tenseness
Complete lack of muscle tone
Diminished muscle tone
Atrophy
Weakening, loss of endurance
Muscle wasting
Myopathy
Joint problems
Problems in movement of joints
Disorders resulting in reduction of functional capacity
Difficulties in bending joints
Stiffening, weakening
Joint complications
Inflamation, swelling
Bursitis
Inability to tolerate normal work load or walking
Postural abnormalities
Postural reflex problems; difficulties sitting
Standing without mechanical aids
Deformities
Uncontrolled postural attitudes
Frozen shoulder
External rotation of HIP
Writhing, wiggling
Head drawn back, extended neck
Paralysis or lack of movement
Flaccid
Hemiplegia, Quadraplegia, Paraplegia
Complete, partial temporary, permanent
Comatose states
Huddling in corners
Catatonic rigidity
Ridigity

Figure 3-2 (continued-E). Tree diagram for mobility needs

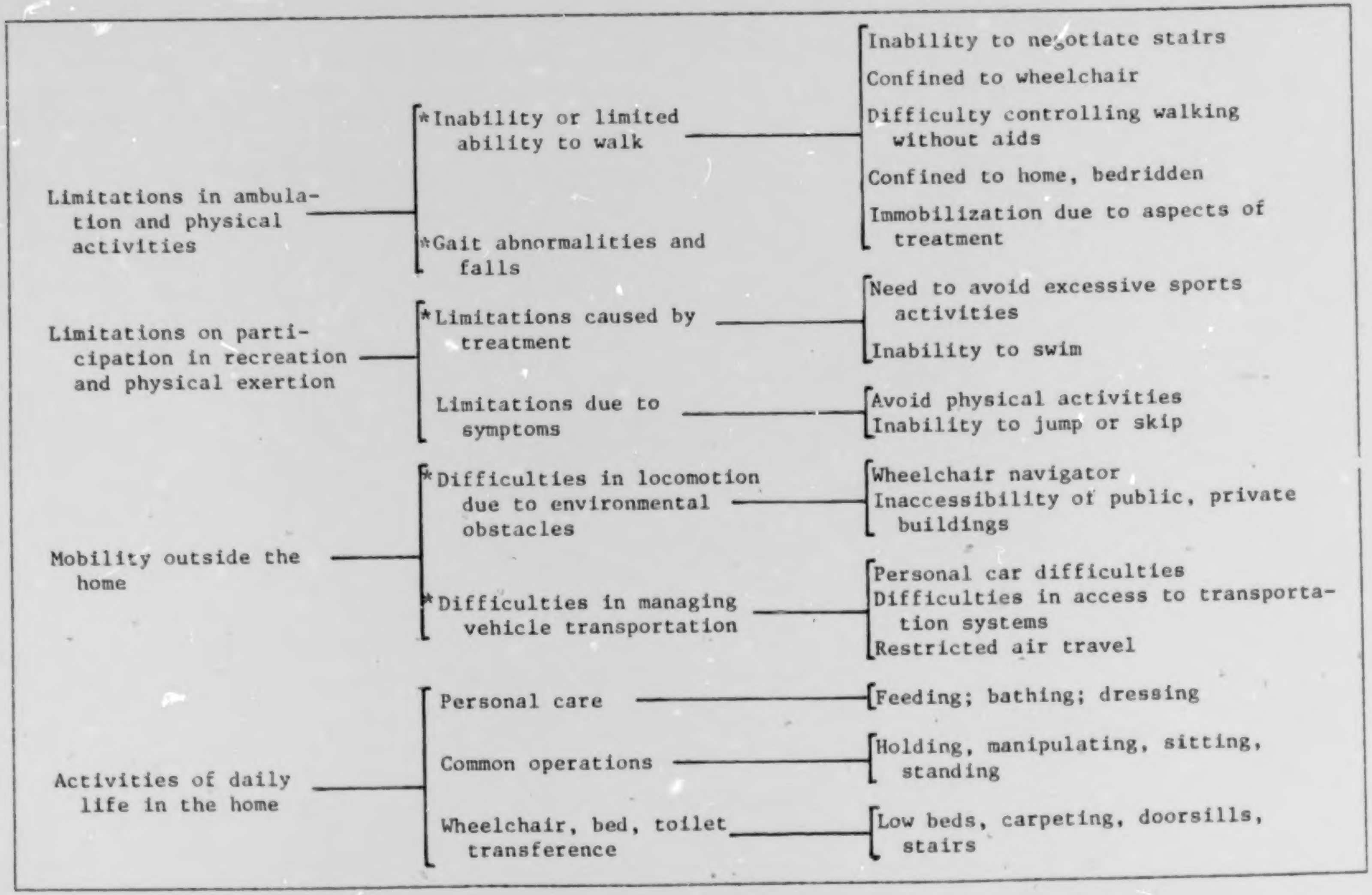
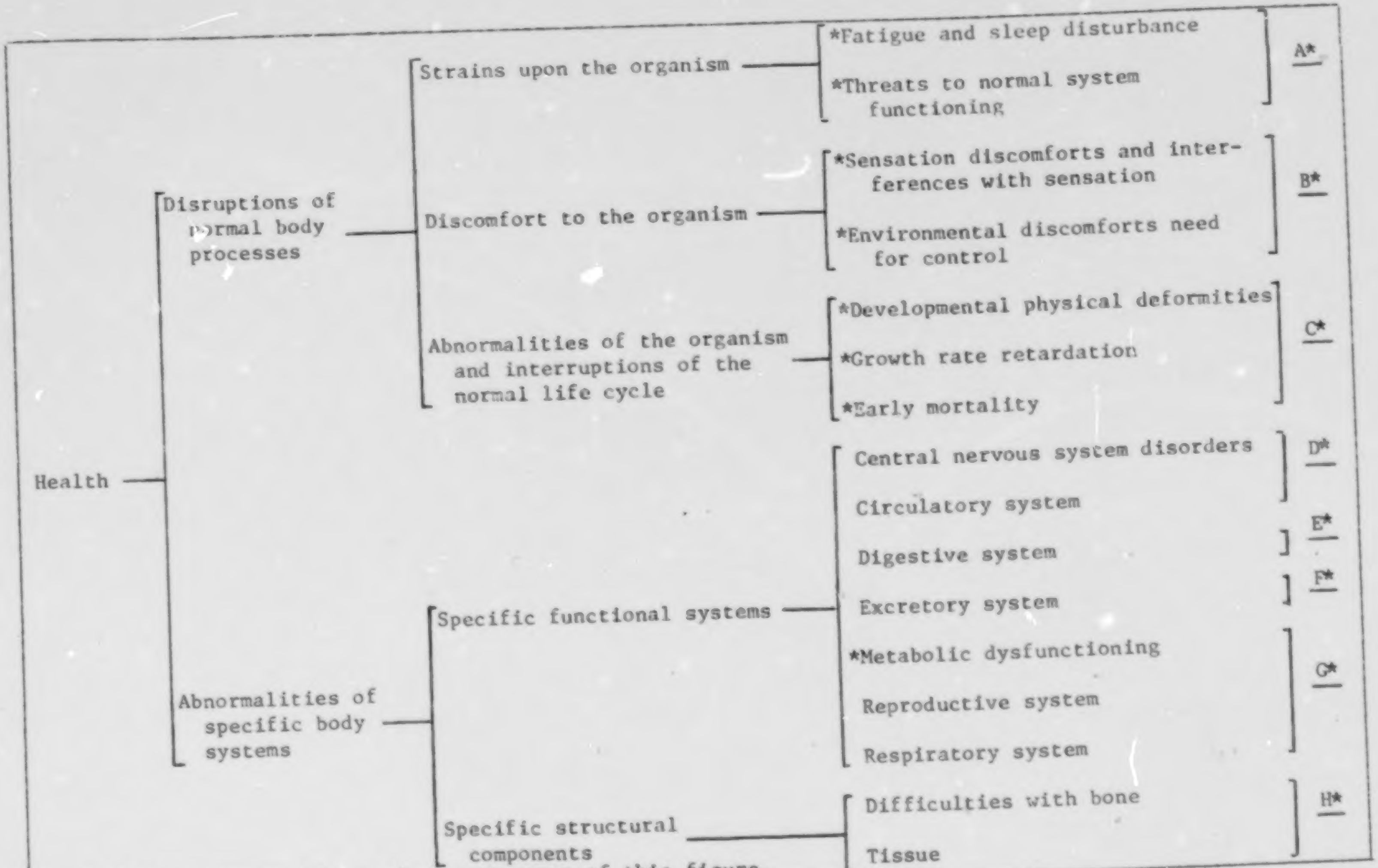

Limitations in ambulation and physical activities
*Inability or limited ability to walk
Inability to negotiate stairs
Confined to wheelchair
Difficulty controlling walking without aids
Confined to home, bedridden
Immobilization due to aspects of treatment
*Gait abnormalities and falls
Limitations on participation in recreation and physical exertion
*Limitations caused by treatment
Need to avoid excessive sports activities
Inability to swim
Limitations due to symptoms
Avoid physical activities
Inability to jump or skip
Mobility outside the home
*Difficulties in locomotion due to environmental obstacles
Wheelchair navigator
Inaccessibility of public, private buildings
*Difficulties in managing vehicle transportation
Personal car difficulties
Difficulties in access to transportation systems
Restricted air travel
Activities of daily life in the home
Personal care
Feeding; bathing; dressing
Common operations
Holding, manipulating, sitting, standing
Wheelchair, bed, toilet transference
Low beds, carpeting, doorsills, stairs

Figure 3-2 (continued-C). Tree diagram for mobility needs


Health
Disruptions of normal body processes
Strains upon the organism
*Fatigue and sleep disturbance
*Threats to normal system functioning
A*
Discomfort to the organism
*Sensation discomforts and interferences with sensation
*Environmental discomforts need for control
B*
Abnormalities of the organism and interruptions of the normal life cycle
*Developmental physical deformities
*Growth rate retardation
*Early mortality
C*
Abnormalities of specific body systems
Specific functional systems
Central nervous system disorders
D*
Circulatory system
E*
Digestive system
F*
Excretory system
*Metabolic dysfunctioning
Reproductive system
Respiratory system
G*
Specific structural components
Difficulties with bone
Tissue
H*

*Tree diagrams continued on subsequent pages of this figure.

Figure 3-3. Tree diagram for health needs

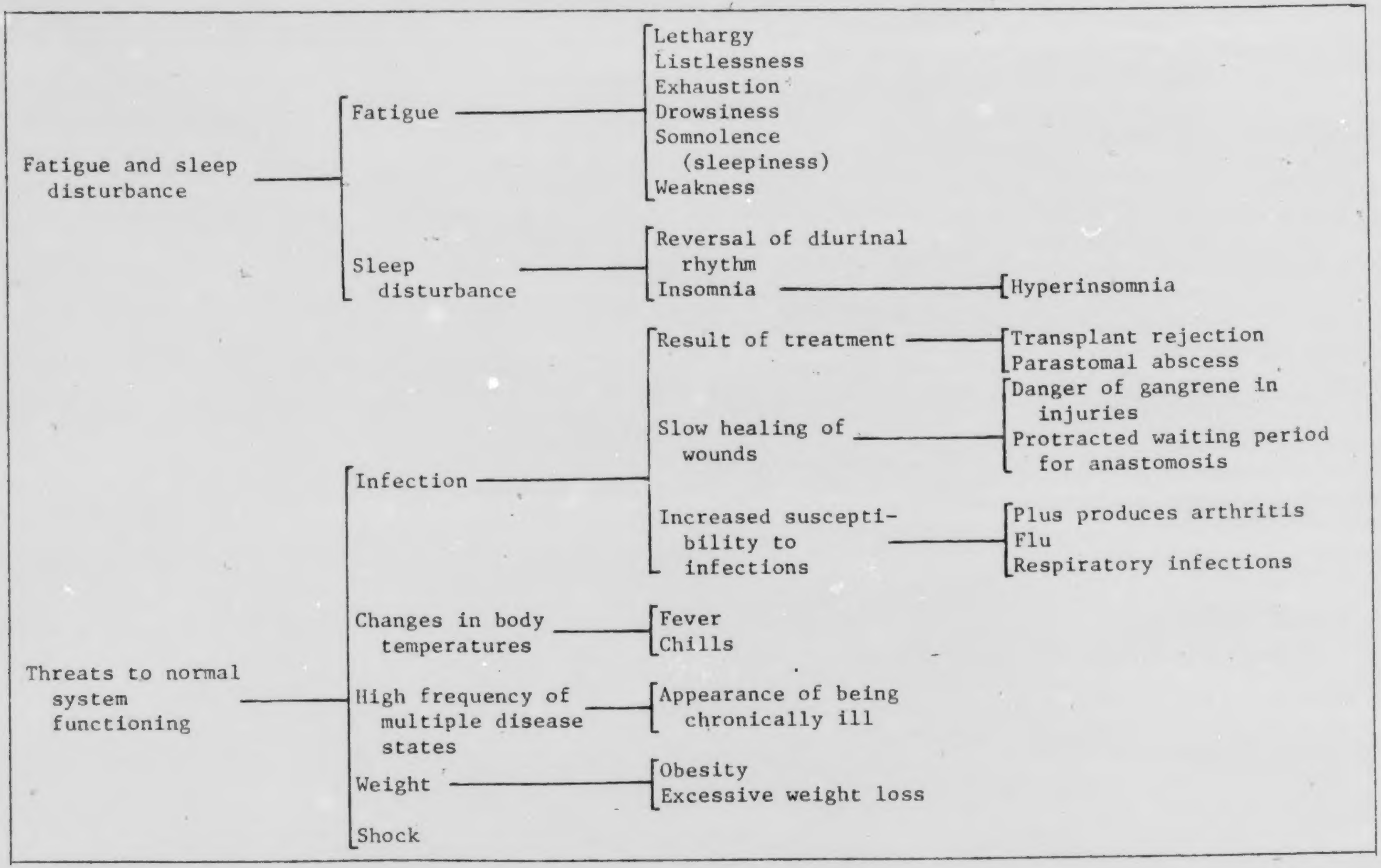

Fatigue and sleep disturbance
Fatigue
Lethargy
Listlessness
Exhaustion
Drowsiness
Somnolence (sleepiness)
Weakness
Sleep disturbance
Reversal of diurnal rhythm
Insomnia
Hyperinsomnia
Threats to normal system functioning
Infection
Result of treatment
Transplant rejection
Parastomal abscess
Slow healing of wounds
Danger of gangrene in injuries
Protracted waiting period for anastomosis
Increased susceptibility to infections
Plus produces arthritis
Flu
Respiratory infections
Changes in body temperatures
Fever
Chills
High frequency of multiple disease states
Appearance of being chronically ill
Weight
Obesity
Excessive weight loss
Shock

Figure 3-3 (continued-A). Tree diagram for health needs

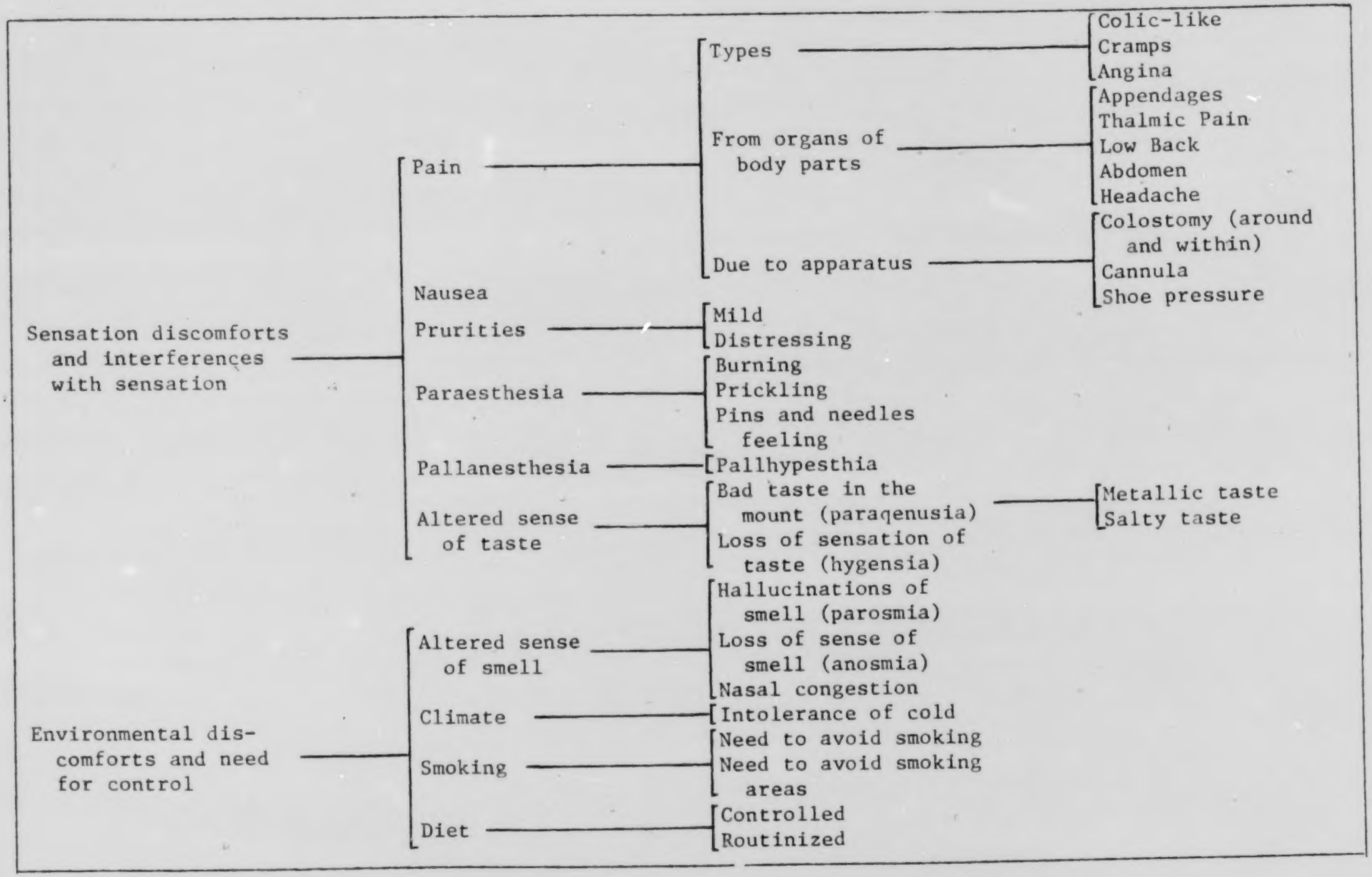

Sensation discomforts and interferences with sensation
Pain
Types
Colic-like
Cramps
Angina
From organs of body parts
Appendages
Thalmic Pain
Low Back
Abdomen
Headache
Due to apparatus
Colostomy (around and within)
Cannula
Shoe pressure
Nausea
Prurities
Mild
Distressing
Paraesthesia
Burning
Prickling
Pins and needles feeling
Pallanesthesia
Pallhypesthia
Altered sense of taste
Bad taste in the mount (paraqenusia)
Metallic taste
Salty taste
Loss of sensation of taste (hygensia)
Environmental discomforts and need for control
Altered sense of smell
Hallucinations of smell (parosmia)
Loss of sense of smell (anosmia)
Nasal congestion
Climate
Intolerance of cold
Smoking
Need to avoid smoking
Need to avoid smoking areas
Diet
Controlled
Routinized

Figure 3-3 (continued-B). Tree diagram for health needs

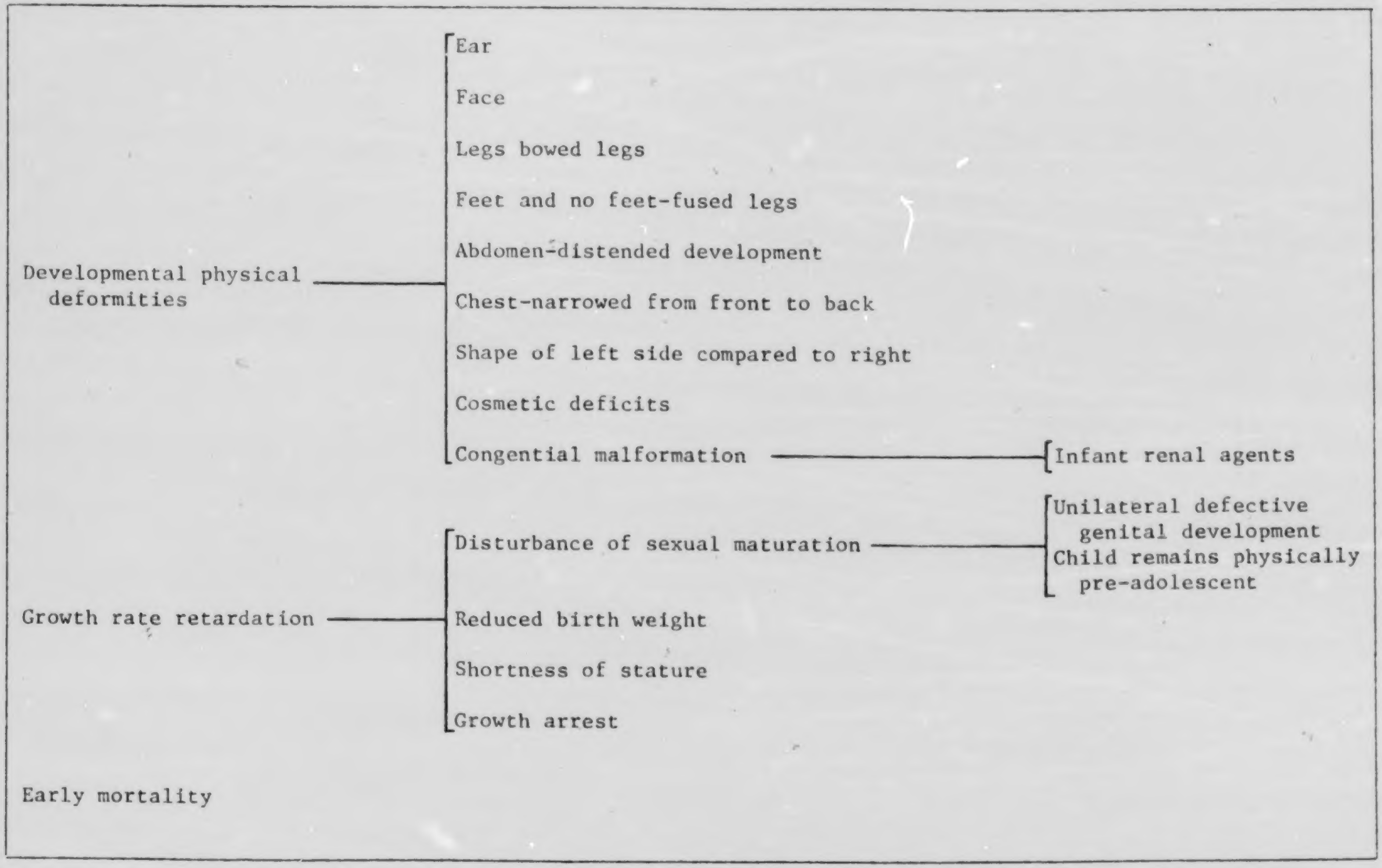

Developmental physical deformities
Ear
Face
Legs bowed legs
Feet and no feet-fused legs
Abdomen-distended development
Chest-narrowed from front to back
Shape of left side compared to right
Cosmetic deficits
Congential malformation
Infant renal agents
Growth rate retardation
Disturbance of sexual maturation
Unilateral defective genital development
Child remains physically pre-adolescent
Reduced birth weight
Shortness of stature
Growth arrest
Early mortality

Figure 3-3 (continued-C). Tree diagram for health needs

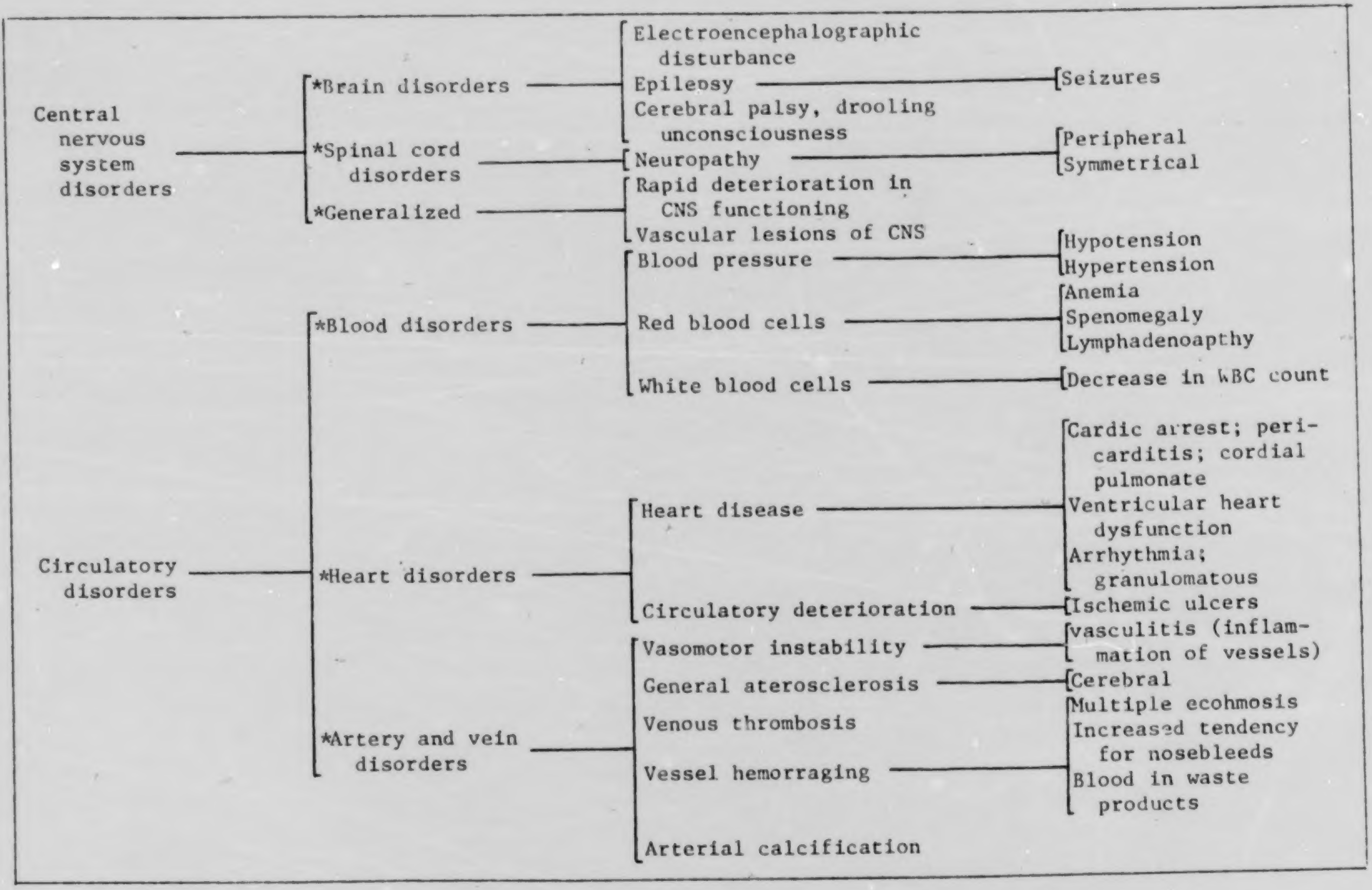

Central nervous system disorders
*Brain disorders
Electroencephalographic disturbance
Epilepsy
Seizures
Cerebral palsy, drooling unconsciousness
*Spinal cord disorders
Neuropathy
Peripheral
Symmetrical
*Generalized
Rapid deterioration in CNS functioning
Vascular lesions of CNS
Circulatory disorders
*Blood disorders
Blood pressure
Hypotension
Hypertension
Red blood cells
Anemia
Spenomegaly
Lymphadenoapthy
White blood cells
Decrease in WBC count
*Heart disorders
Heart disease
Cardic arrest; pericarditis; cordial pulmonate
Ventricular heart dysfunction
Arrhythmia; granulomatous
Circulatory deterioration
Ischemic ulcers
*Artery and vein disorders
Vasomotor instability
vasculitis (inflammation of vessels)
General aterosclerosis
Cerebral
Venous thrombosis
Vessel hemorraging
Multiple ecohmosis
Increased tendency for nosebleeds
Blood in waste products
Arterial calcification

Figure 3-3 (continued-D). Tree diagram for health needs

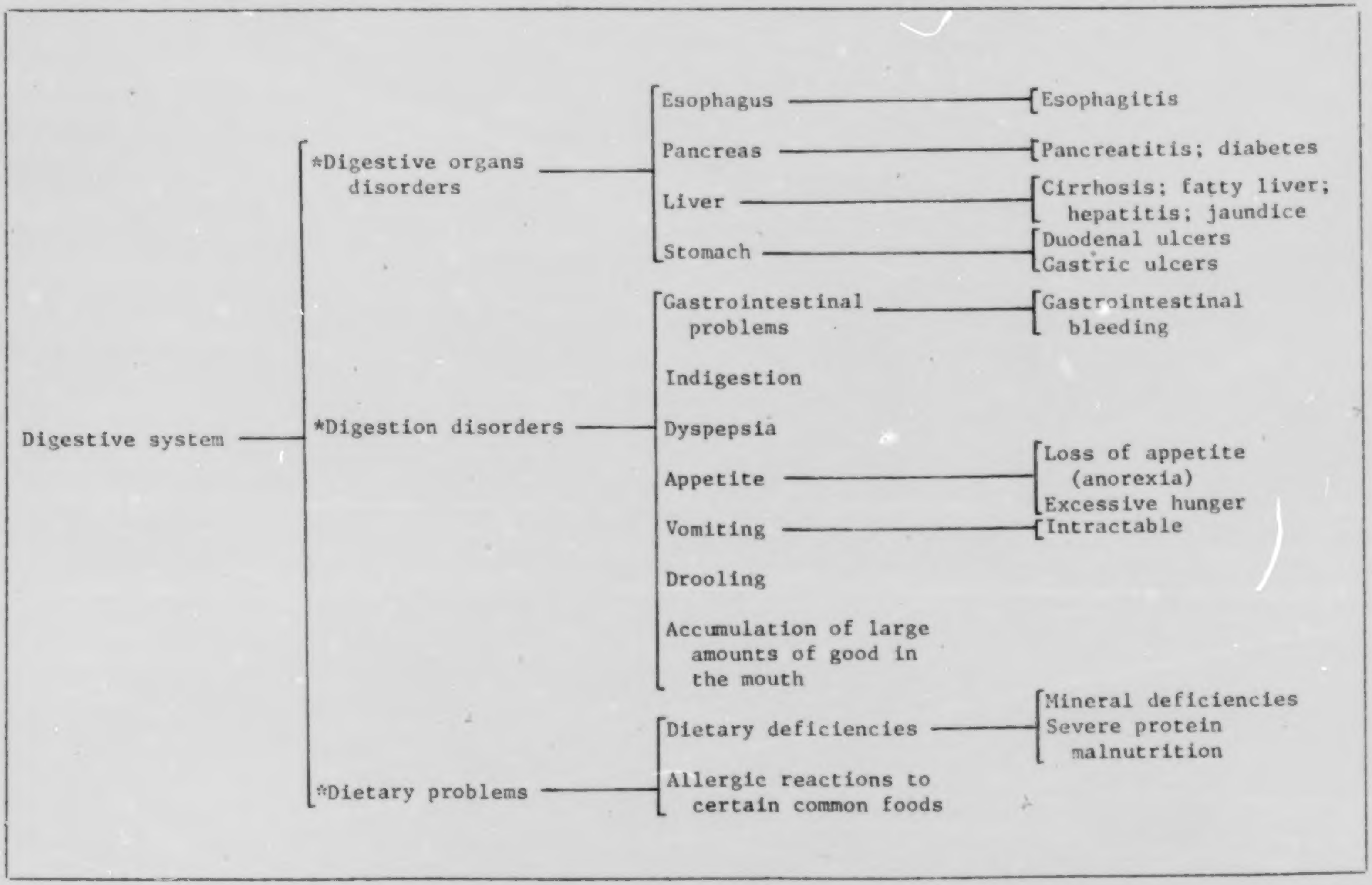

Digestive system
*Digestive organs disorders
Esophagus
Esophagitis
Pancreas
Pancreatitis; diabetes
Liver
Cirrhosis; fatty liver; hepatitis; jaundice
Stomach
Duodenal ulcers
Gastric ulcers
*Digestion disorders
Gastrointestinal problems
Gastrointestinal bleeding
Indigestion
Dyspepsia
Appetite
Loss of appetite (anorexia)
Excessive hunger
Vomiting
Intractable
Drooling
Accumulation of large amounts of good in the mouth
*Dietary problems
Dietary deficiencies
Mineral deficiencies
Severe protein malnutrition
Allergic reactions to certain common foods

Figure 3-3 (continued-E). Tree diagram for health needs

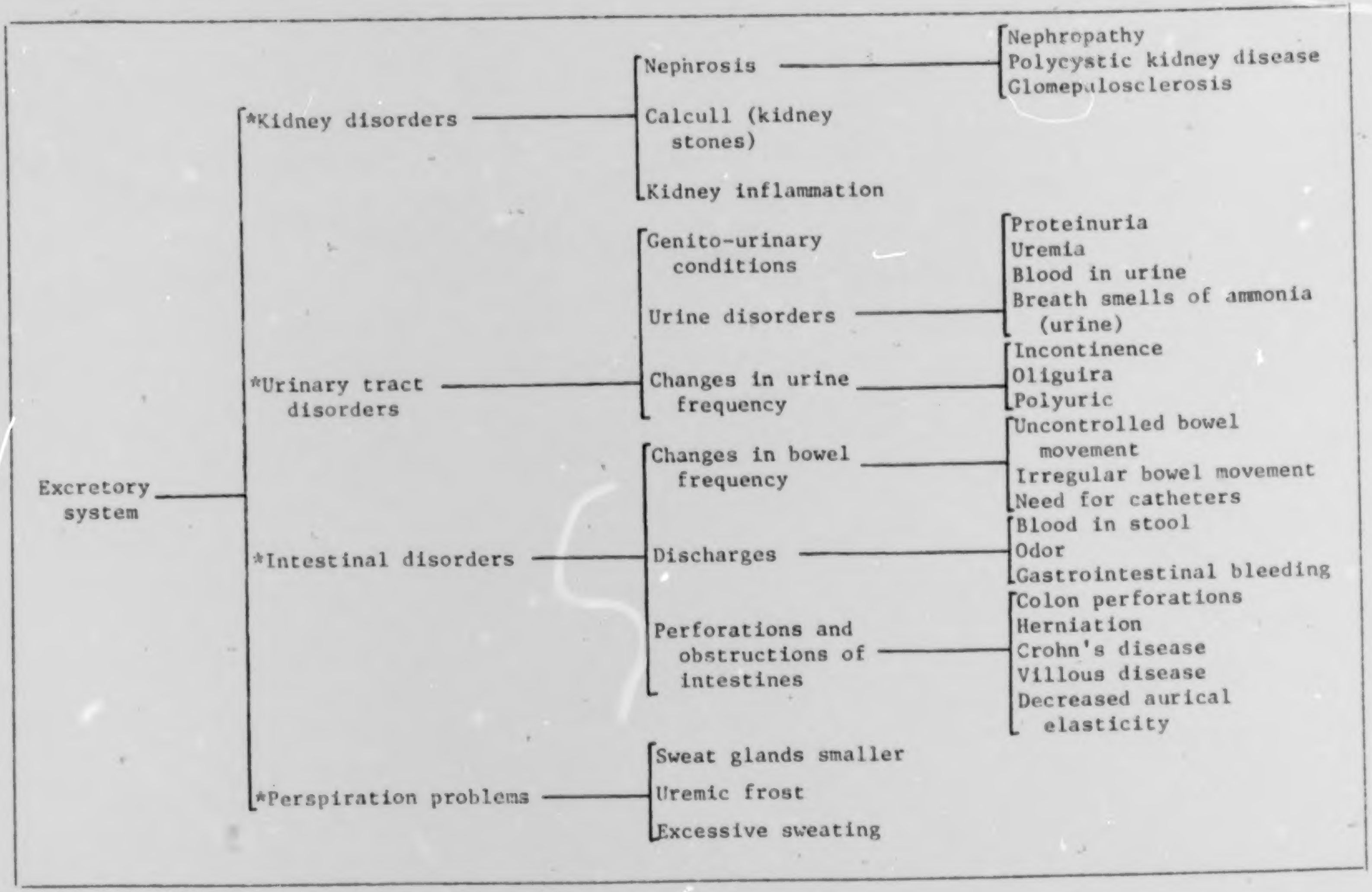

Excretory system
*Kidney disorders
Nephrosis
Nephropathy
Polycystic kidney disease
Glomepulosclerosis
Calcull (kidney stones)
Kidney inflammation
*Urinary tract disorders
Genito-urinary conditions
Urine disorders
Proteinuria
Uremia
Blood in urine
Breath smells of ammonia (urine)
Changes in urine frequency
Incontinence
Oliguira
Polyuric
*Intestinal disorders
Changes in bowel frequency
Uncontrolled bowel movement
Irregular bowel movement
Need for catheters
Discharges
Blood in stool
Odor
Gastrointestinal bleeding
Perforations and obstructions of intestines
Colon perforations
Herniation
Crohn's disease
Villous disease
Decreased aurical elasticity
*Perspiration problems
Sweat glands smaller
Uremic frost
Excessive sweating

Figure 3-3 (continued-F). Tree diagram for health needs

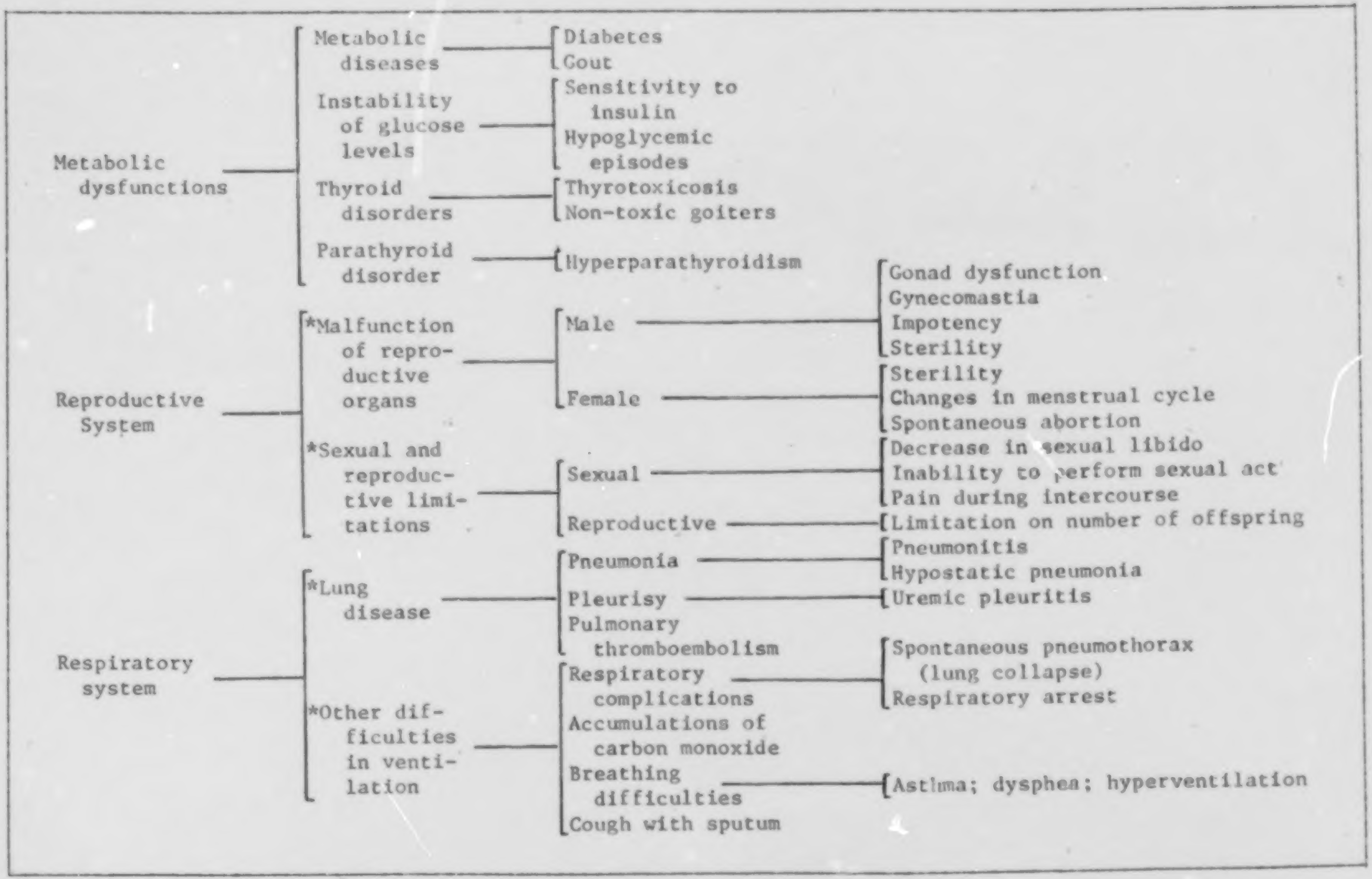

Metabolic dysfunctions
Metabolic diseases
Diabetes
Gout
Instability of glucose levels
Sensitivity to insulin
Hypoglycemic episodes
Thyroid disorders
Thyrotoxicosis
Non-toxic goiters
Parathyroid disorder
Hyperparathyroidism
Reproductive System
*Malfunction of reproductive organs
Male
Gonad dysfunction
Gynecomastia
Impotency
Sterility
Female
Sterility
Changes in menstrual cycle
Spontaneous abortion
*Sexual and reproductive limitations
Sexual
Decrease in sexual libido
Inability to perform sexual act
Pain during intercourse
Reproductive
Limitation on number of offspring
Respiratory system
*Lung disease
Pneumonia
Pneumonitis
Hypostatic pneumonia
Pleurisy
Uremic pleuritis
Pulmonary thromboembolism
*Other difficulties in ventilation
Respiratory complications
Spontaneous pneumothorax (lung collapse)
Respiratory arrest
Accumulations of carbon monoxide
Breathing difficulties
Asthma; dysphea; hyperventilation
Cough with sputum

Figure 3-3 (continued-G). Tree diagram for health needs

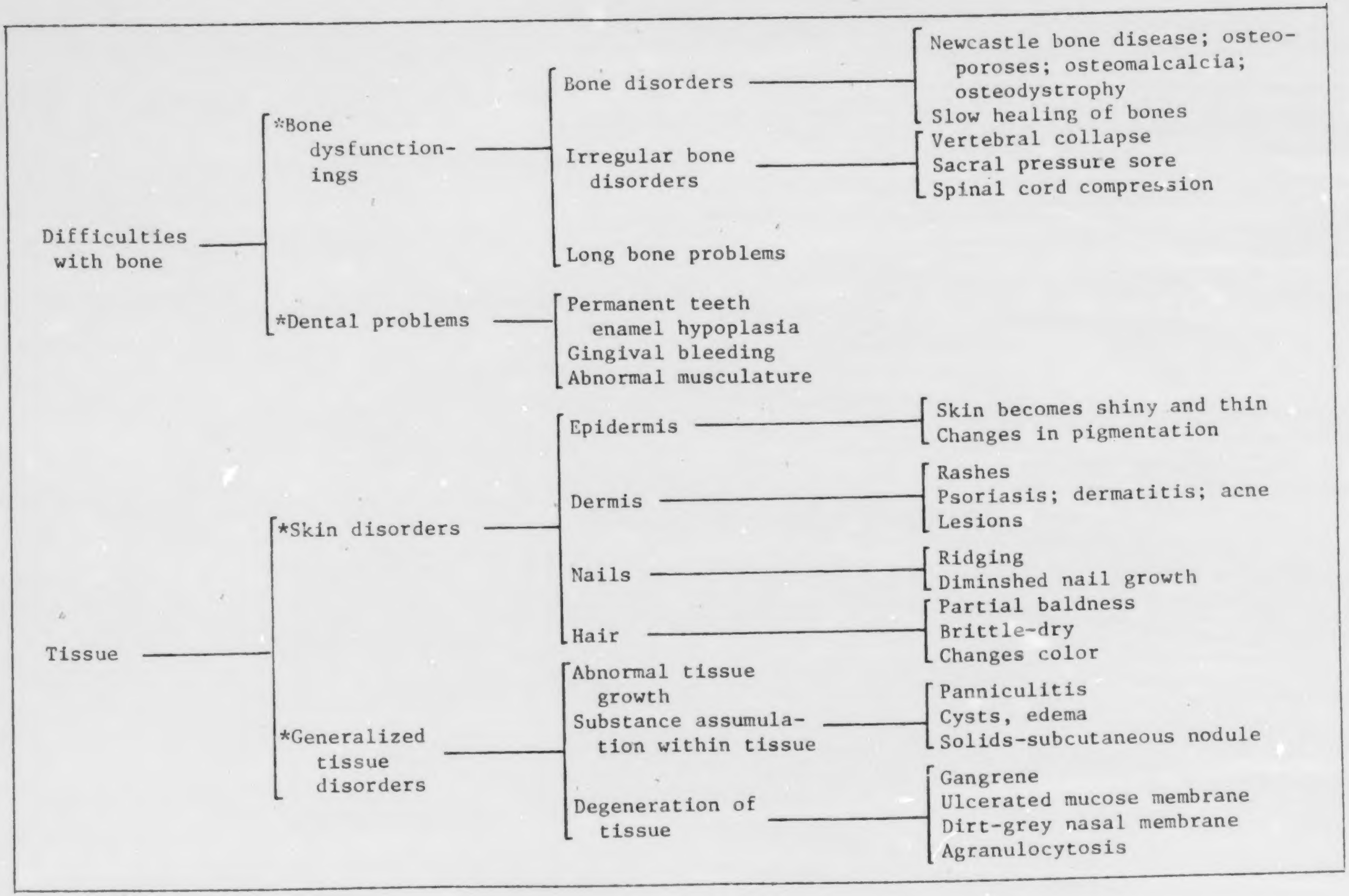
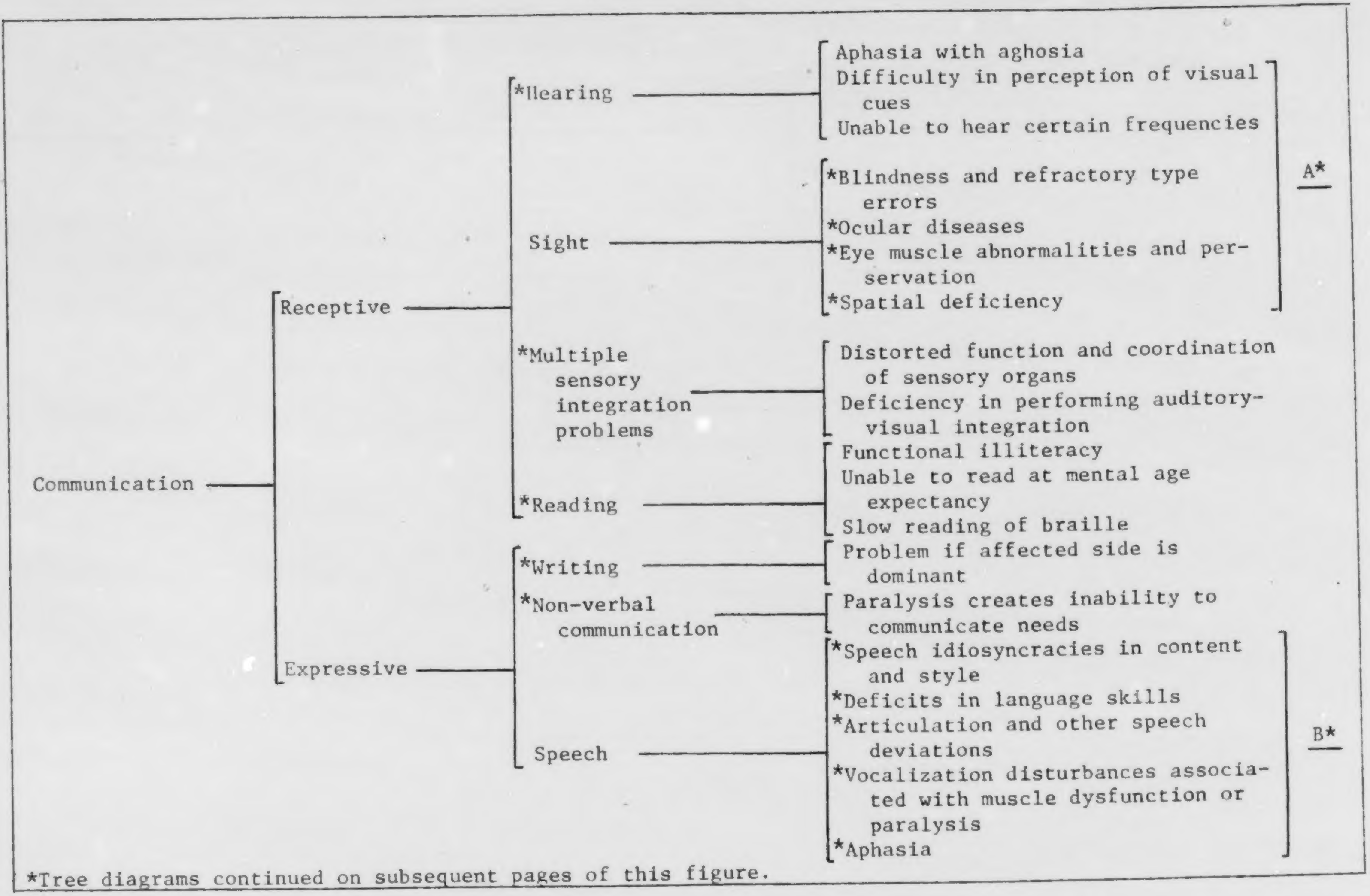

Difficulties with bone
*Bone dysfunctionings
Bone disorders
Newcastle bone disease; osteoporoses; osteomalcalcia; osteodystrophy
Slow healing of bones
Irregular bone disorders
Vertebral collapse
Sacral pressure sore
Spinal cord compression
Long bone problems
*Dental problems
Permanent teeth enamel hypoplasia
Gingival bleeding
Abnormal musculature
Tissue
*Skin disorders
Epidermis
Skin becomes shiny and thin
Changes in pigmentation
Dermis
Rashes
Psoriasis; dermatitis; acne
Lesions
Nails
Ridging
Diminshed nail growth
Hair
Partial baldness
Brittle-dry
Changes color
*Generalized tissue disorders
Abnormal tissue growth
Substance assumulation within tissue
Panniculitis
Cysts, edema
Solids-subcutaneous nodule
Degeneration of tissue
Gangrene
Ulcerated mucose membrane
Dirt-grey nasal membrane
Agranulocytosis

Figure 3-3 (continued-H). Tree diagram for health needs


Communication
Receptive
Expressive
*Hearing
Sight
*Multiple sensory integration problems
*Reading
*Writing
*Non-verbal communication
Speech
Aphasia with aghosia
Difficulty in perception of visual cues
Unable to hear certain frequencies
*Blindness and refractory type errors
*Ocular diseases
*Eye muscle abnormalities and perservation
*Spatial deficiency
Distorted function and coordination of sensory organs
Deficiency in performing auditory-visual integration
Functional illiteracy
Unable to read at mental age expectancy
Slow reading of braille
Problem if affected side is dominant
Paralysis creates inability to communicate needs
*Speech idiosyncracies in content and style
*Deficits in language skills
*Articulation and other speech deviations
*Vocalization disturbances associated with muscle dysfunction or paralysis
*Aphasia
A*
B*

*Tree diagrams continued on subsequent pages of this figure.

Figure 3-4. Tree diagram for communication needs

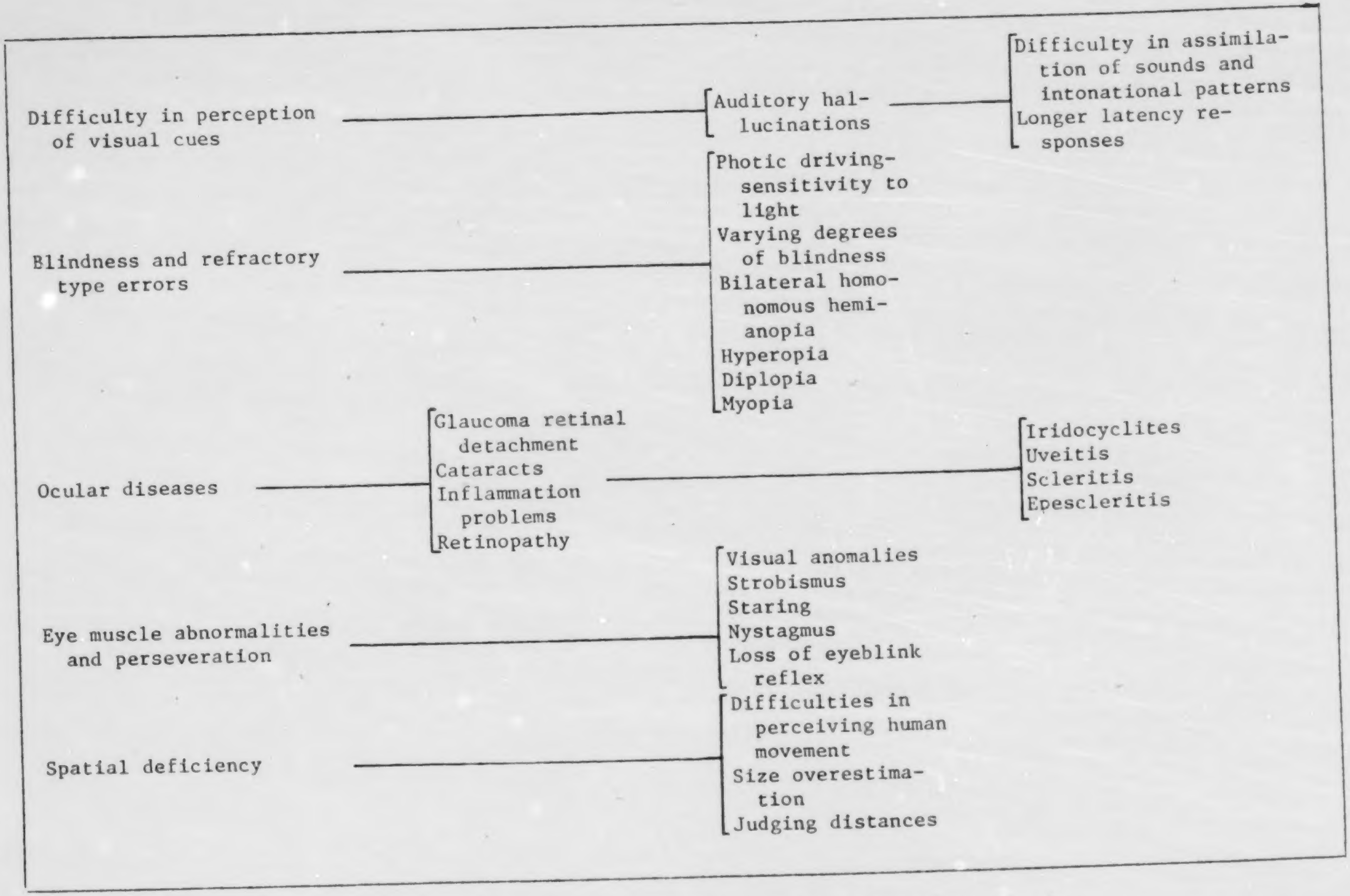

Difficulty in perception of visual cues
Auditory hallucinations
Difficulty in assimilation of sounds and intonational patterns
Longer latency responses
Blindness and refractory type errors
Photic driving-sensitivity to light
Varying degrees of blindness
Bilateral homonomous hemianopia
Hyperopia
Diplopia
Myopia
Ocular diseases
Glaucoma retinal detachment
Cataracts
Inflammation problems
Retinopathy
Iridocyclites
Uveitis
Scleritis
Epescleritis
Eye muscle abnormalities and perseveration
Visual anomalies
Strobismus
Staring
Nystagmus
Loss of eyeblink reflex
Spatial deficiency
Difficulties in perceiving human movement
Size overestimation
Judging distances

Figure 3-4 (continued-A). Tree diagram for communication needs

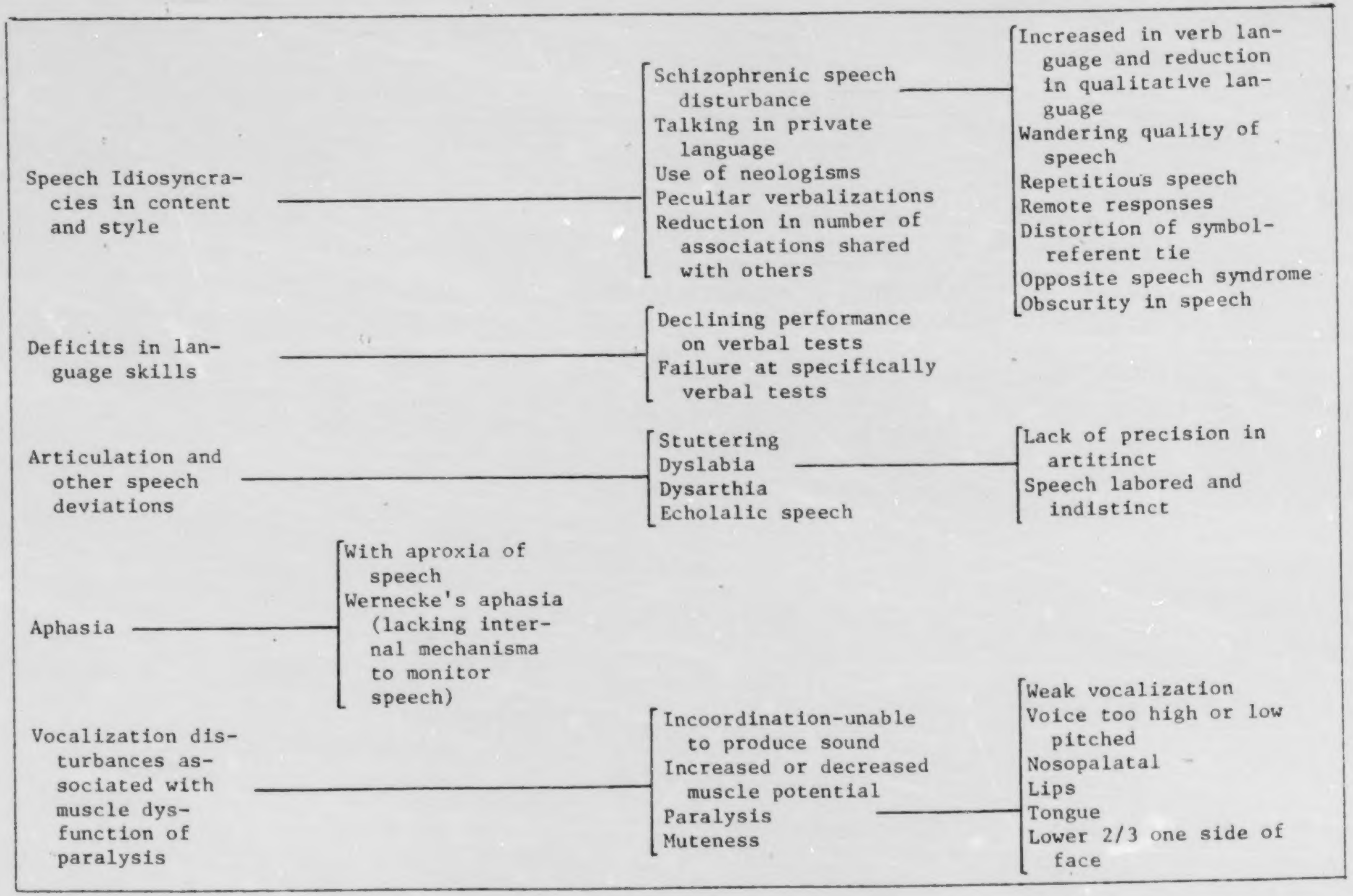
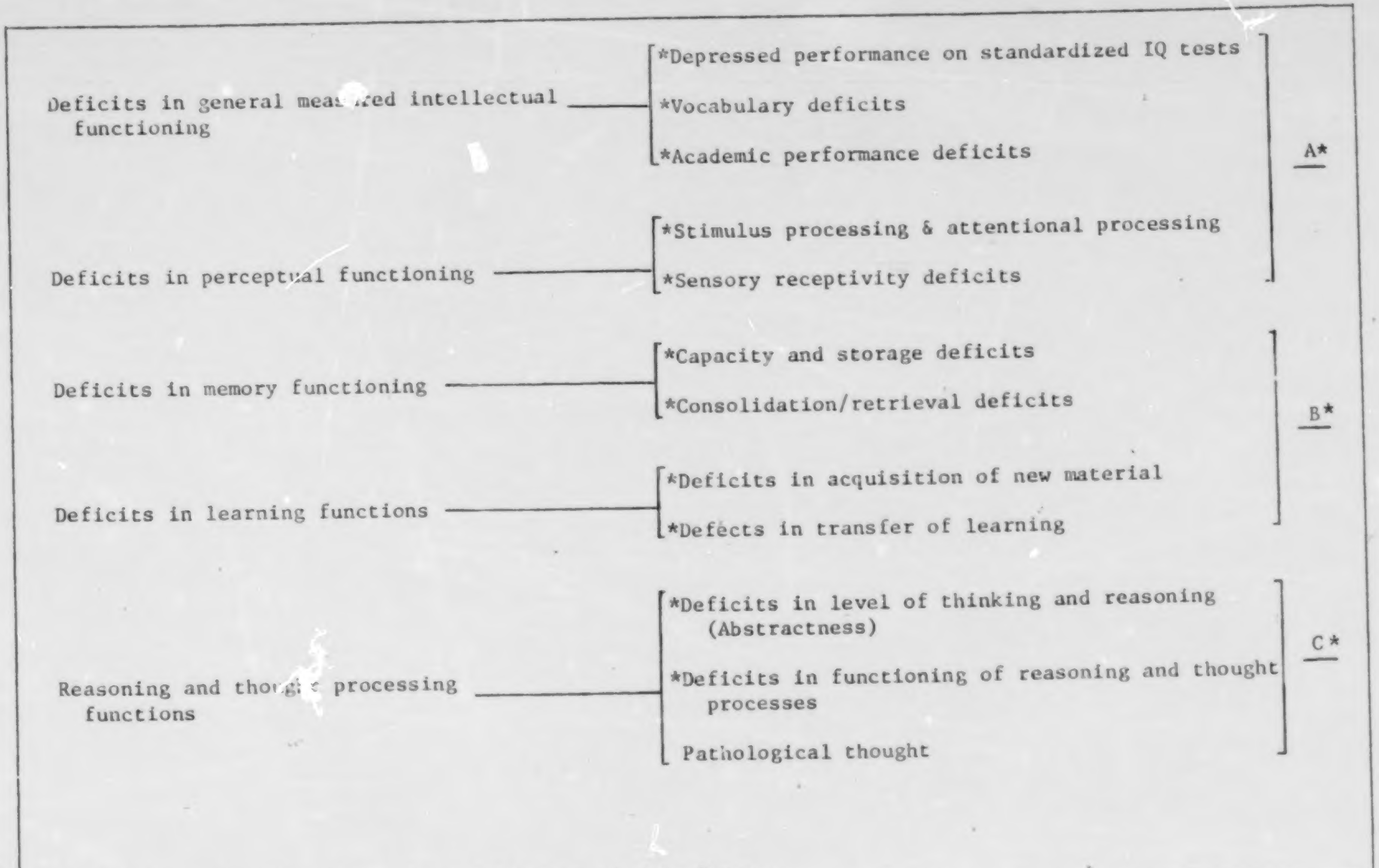

Speech Idiosyncracies in content and style
Schizophrenic speech disturbance
Talking in private language
Use of neologisms
Peculiar verbalizations
Reduction in number of associations shared with others
Increased in verb language and reduction in qualitative language
Wandering quality of speech
Repetitious speech
Remote responses
Distortion of symbol-referent tie
Opposite speech syndrome
Obscurity in speech
Deficits in language skills
Declining performance on verbal tests
Failure at specifically verbal tests
Articulation and other speech deviations
Stuttering
Dyslabia
Dysarthia
Echolalic speech
Lack of precision in artitinct
Speech labored and indistinct
Aphasia
With aproxia of speech
Wernecke's aphasia (lacking internal mechanisma to monitor speech)
Vocalization disturbances associated with muscle dysfunction of paralysis
Incoordination-unable to produce sound
Increased or decreased muscle potential
Paralysis
Muteness
Weak vocalization
Voice too high or low pitched
Nosopalatal
Lips
Tongue
Lower 2/3 one side of face

Figure 3-4 (continued-B). Tree diagram for communication needs


Deficits in general measured intellectual functioning
*Depressed performance on standardized IQ tests
*Vocabulary deficits
*Academic performance deficits
Deficits in perceptual functioning
*Stimulus processing & attentional processing
*Sensory receptivity deficits
A*
Deficits in memory functioning
*Capacity and storage deficits
*Consolidation/retrieval deficits
Deficits in learning functions
*Deficits in acquisition of new material
*Defects in transfer of learning
B*
Reasoning and thought processing functions
*Deficits in level of thinking and reasoning (Abstractness)
*Deficits in functioning of reasoning and thought processes
Pathological thought
C*

*Tree diagrams continued on subsequent pages of this figure.

Figure 3-5. Tree diagram for cognitive-intellectual needs

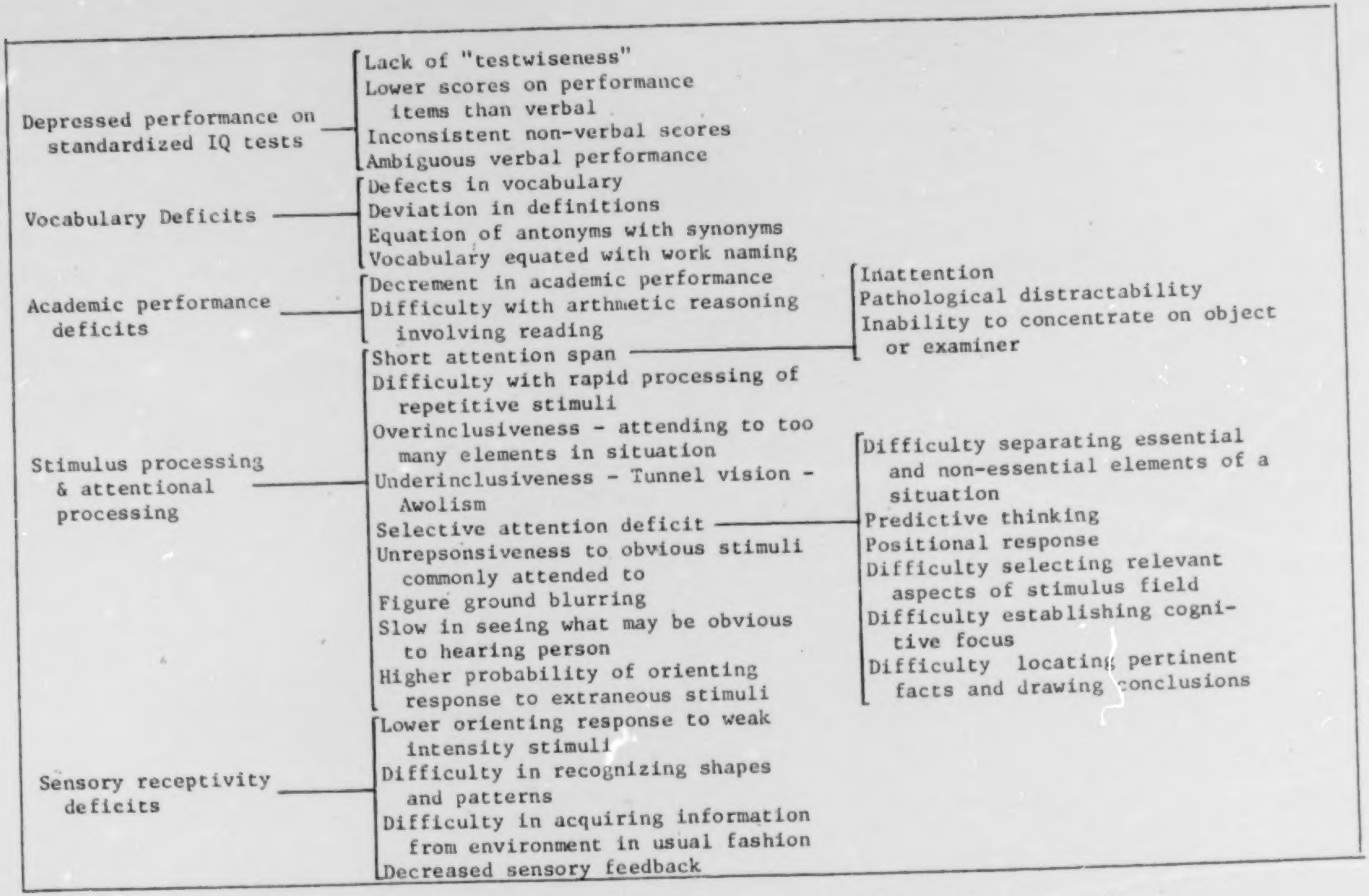

Depressed performance on standardized IQ tests
Lack of "testwiseness"
Lower scores on performance items than verbal
Inconsistent non-verbal scores
Ambiguous verbal performance
Vocabulary Deficits
Defects in vocabulary
Deviation in definitions
Equation of antonyms with synonyms
Vocabulary equated with work naming
Academic performance deficits
Decrement in academic performance
Difficulty with arthmetic reasoning involving reading
Stimulus processing & attentional processing
Short attention span
Inattention
Pathological distractability
Inability to concentrate on object or examiner
Difficulty with rapid processing of repetitive stimuli
Overinclusiveness - attending to too many elements in situation
Underinclusiveness - Tunnel vision - Awolism
Selective attention deficit
Difficulty separating essential and non-essential elements of a situation
Predictive thinking
Positional response
Difficulty selecting relevant aspects of stimulus field
Difficulty establishing cognitive focus
Difficulty locating pertinent facts and drawing conclusions
Unrepsonsiveness to obvious stimuli commonly attended to
Figure ground blurring
Slow in seeing what may be obvious to hearing person
Higher probability of orienting response to extraneous stimuli
Sensory receptivity deficits
Lower orienting response to weak intensity stimuli
Difficulty in recognizing shapes and patterns
Difficulty in acquiring information from environment in usual fashion
Decreased sensory feedback

Figure 3-5 (continued-A). Tree diagram for cognitive/intellectual needs

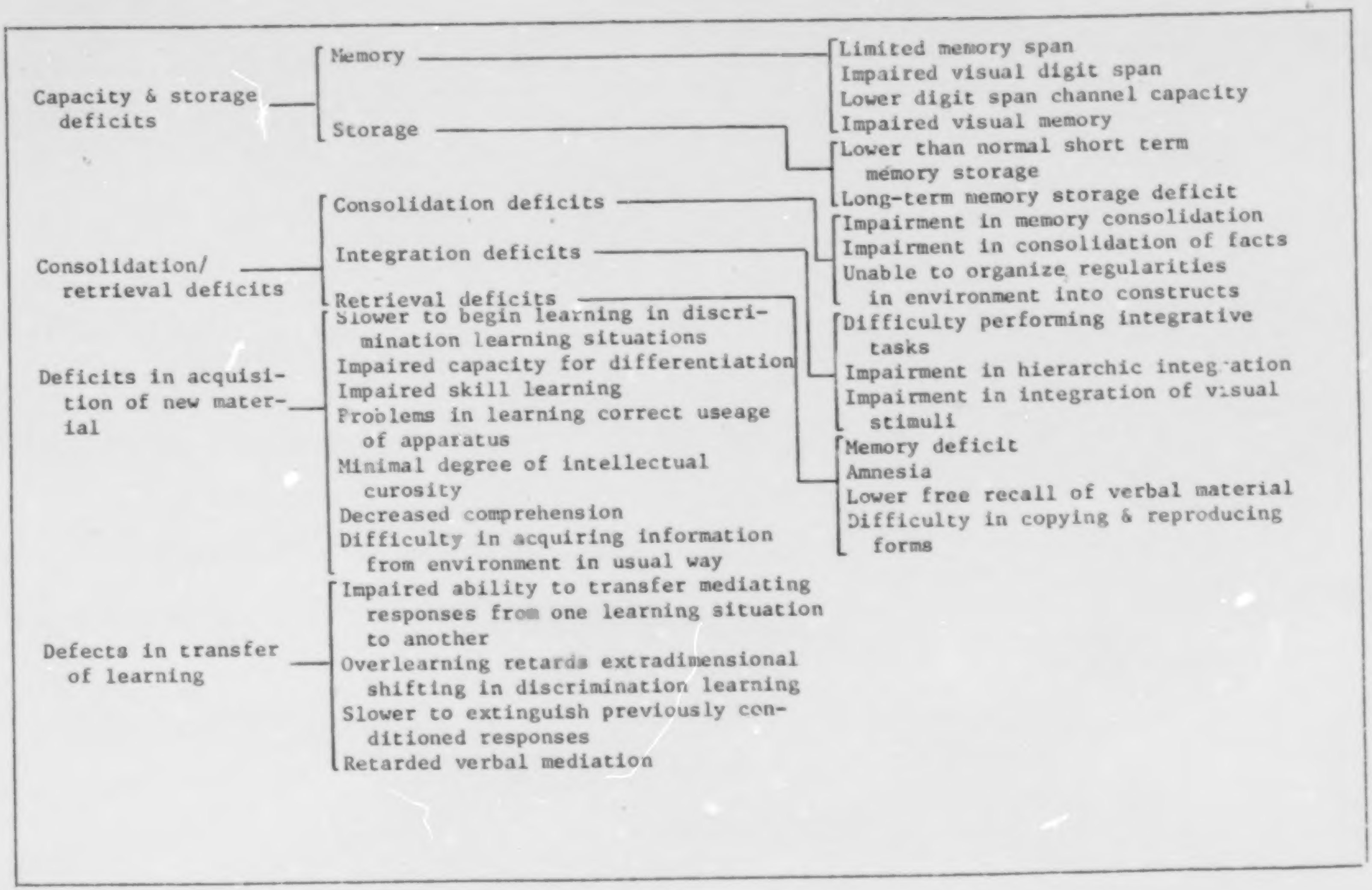

Capacity & storage deficits
Memory
Storage
Limited memory span
Impaired visual digit span
Lower digit span channel capacity
Impaired visual memory
Lower than normal short term memory storage
Long-term memory storage deficit
Consolidation/ retrieval deficits
Consolidation deficits
Integration deficits
Retrieval deficits
Impairment in memory consolidation
Impairment in consolidation of facts
Unable to organize regularities in environment into constructs
Difficulty performing integrative tasks
Impairment in hierarchic integration
Impairment in integration of visual stimuli
Memory deficit
Amnesia
Lower free recall of verbal material
Difficulty in copying & reproducing forms
Deficits in acquisition of new material
Slower to begin learning in discrimination learning situations
Impaired capacity for differentiation
Impaired skill learning
Problems in learning correct useage of apparatus
Minimal degree of intellectual curosity
Decreased comprehension
Difficulty in acquiring information from environment in usual way
Defects in transfer of learning
Impaired ability to transfer mediating responses from one learning situation to another
Overlearning retards extradimensional shifting in discrimination learning
Slower to extinguish previously conditioned responses
Retarded verbal mediation

Figure 3-5 (continued-B). Tree diagram for cognitive/intellectual needs

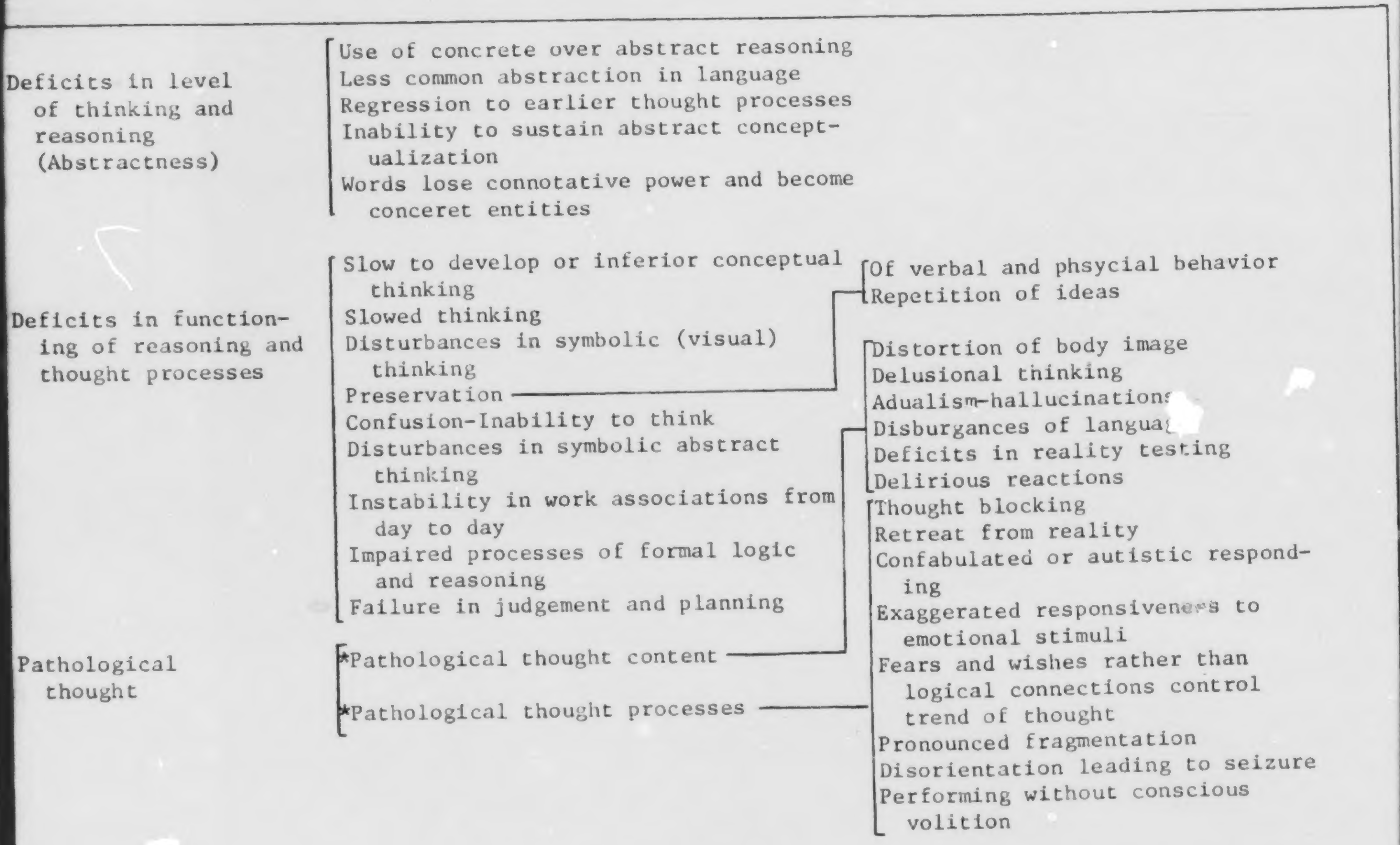
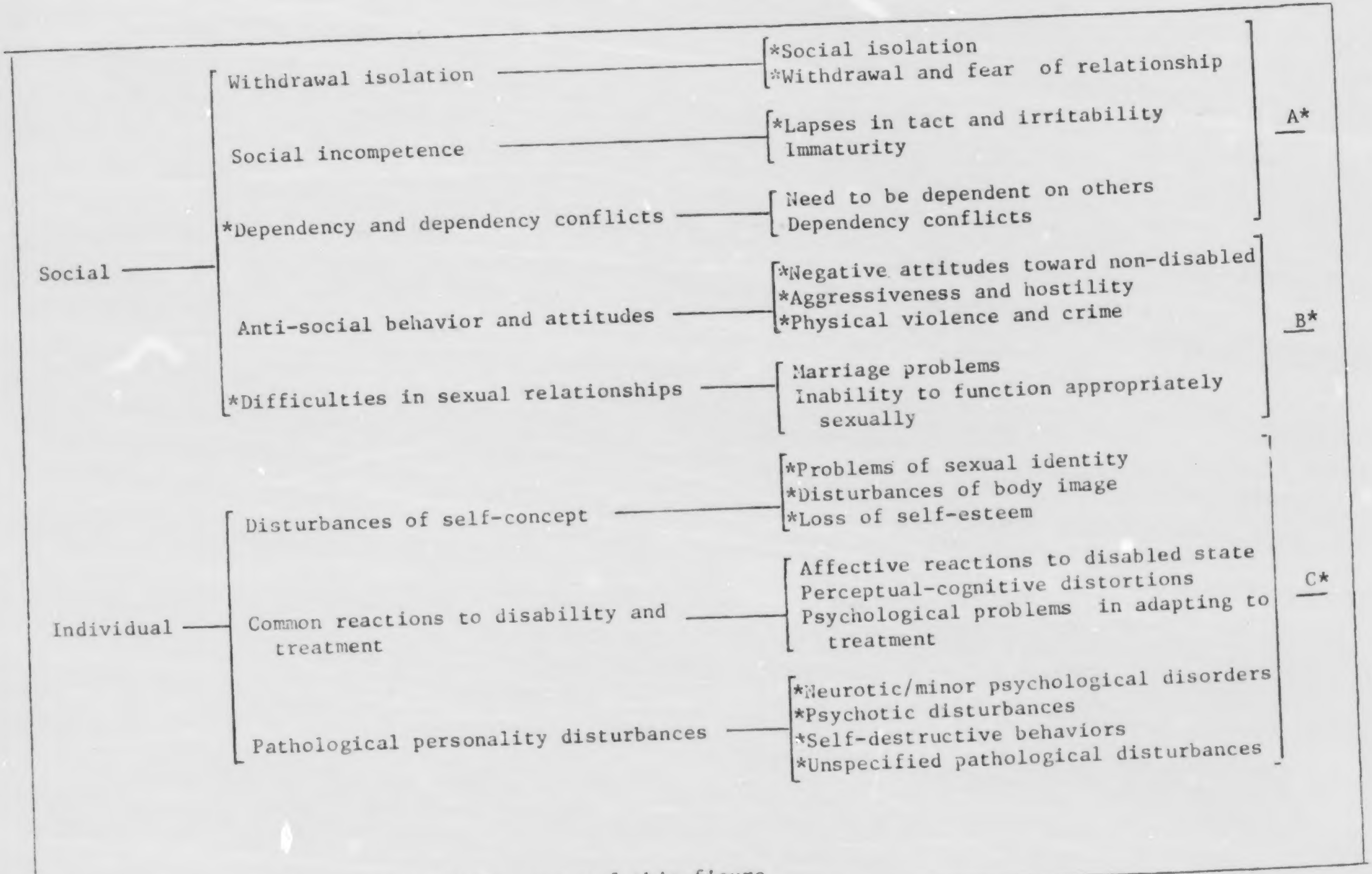

Deficits in level of thinking and reasoning (Abstractness)
Use of concrete over abstract reasoning
Less common abstraction in language
Regression to earlier thought processes
Inability to sustain abstract conceptualization
Words lose connotative power and become concerent entities
Deficits in functioning of reasoning and thought processes
Slow to develop or inferior conceptual thinking
Slowed thinking
Disturbances in symbolic (visual) thinking
Preservation
Confusion-Inability to think
Disturbances in symbolic abstract thinking
Instability in work associations from day to day
Impaired processes of formal logic and reasoning
Failure in judgement and planning
Of verbal and phsycial behavior
Repetition of ideas
Pathological thought
*Pathological thought content
*Pathological thought processes
Distortion of body image
Delusional thinking
Adualism-hallucinations
Disburgances of language
Deficits in reality testing
Delirious reactions
Thought blocking
Retreat from reality
Confabulated or autistic responding
Exaggerated responsiveness to emotional stimuli
Fears and wishes rather than logical connections control trend of thought
Pronounced fragmentation
Disorientation leading to seizure
Performing without conscious volition

Figure 3-5 (continued-C). Tree diagram for cognitive/intellectual needs


Social
Withdrawal isolation
*Social isolation
*Withdrawal and fear of relationship
Social incompetence
*Lapses in tact and irritability
Immaturity
*Dependency and dependency conflicts
Need to be dependent on others
Dependency conflicts
A*
Anti-social behavior and attitudes
*Negative attitudes toward non-disabled
*Aggressiveness and hostility
*Physical violence and crime
*Difficulties in sexual relationships
Marriage problems
Inability to function appropriately sexually
B*
Individual
Disturbances of self-concept
*Problems of sexual identity
*Disturbances of body image
*Loss of self-esteem
Common reactions to disability and treatment
Affective reactions to disabled state
Perceptual-cognitive distortions
Psychological problems in adapting to treatment
Pathological personality disturbances
*Neurotic/minor psychological disorders
*Psychotic disturbances
*Self-destructive behaviors
*Unspecified pathological disturbances
C*

*Tree diagrams continued on subsequent pages of this figure.

Figure 3-6. Tree diagram for social/attitudinal needs

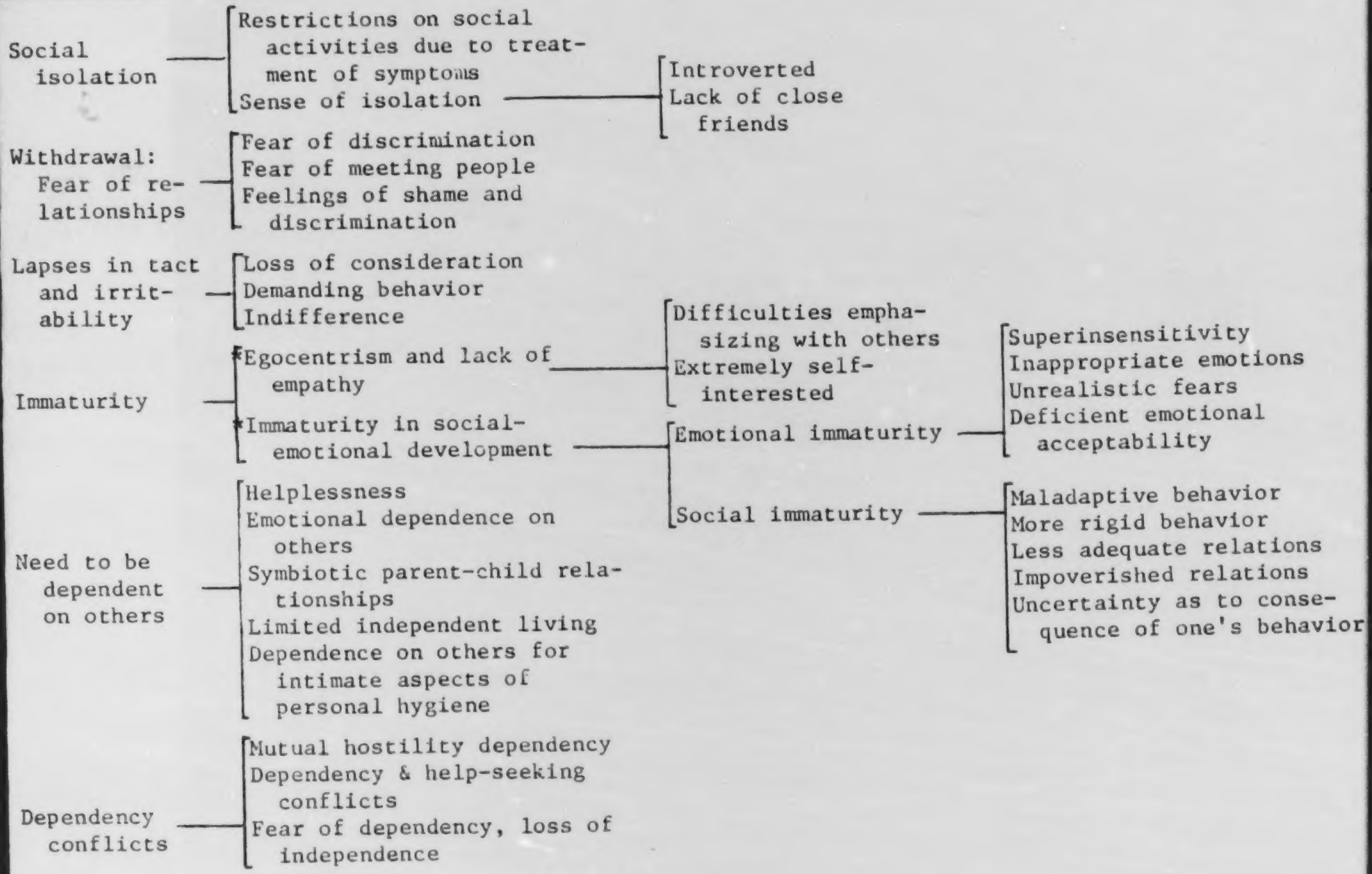
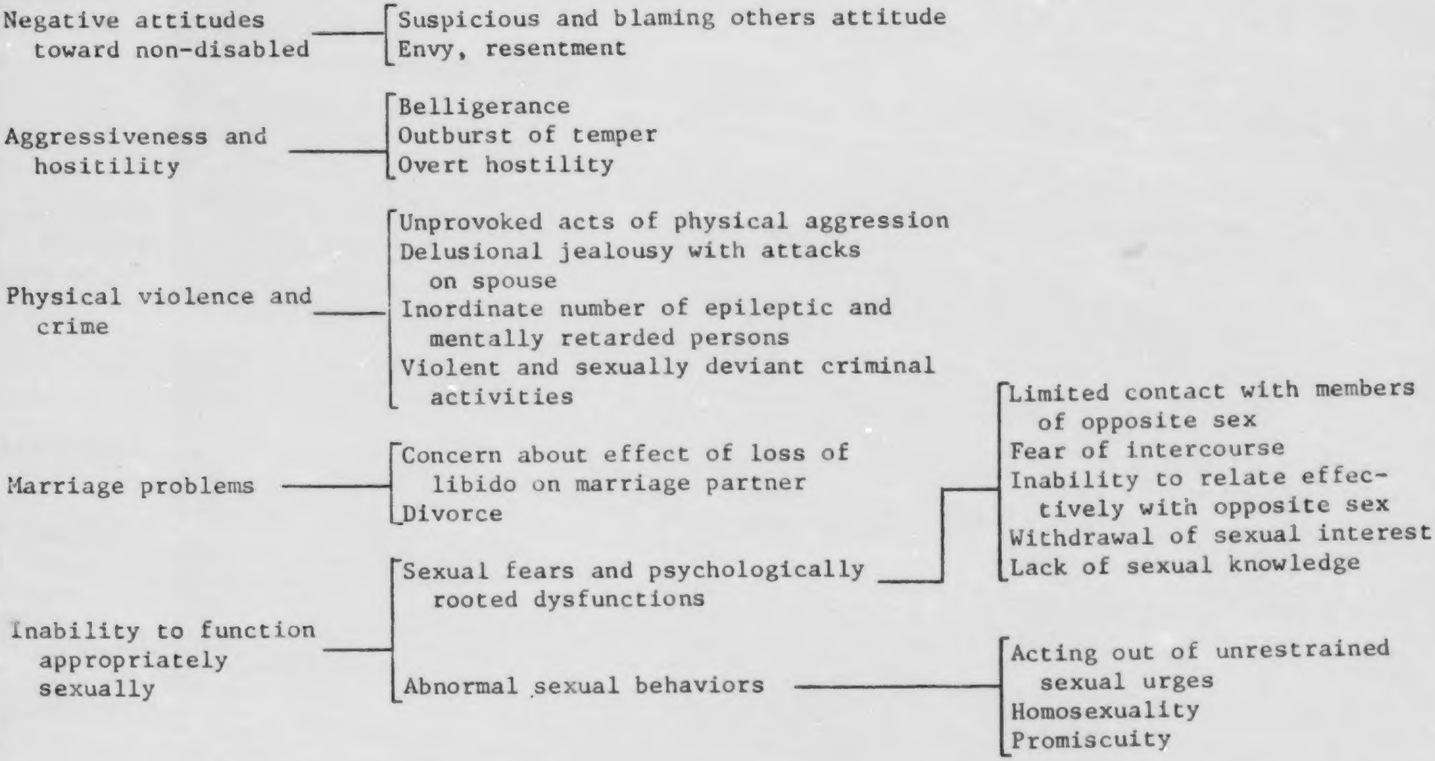

Social isolation
Restrictions on social activities due to treatment of symptoms
Sense of isolation
Introverted
Lack of close friends
Withdrawal: Fear of relationships
Fear of discrimination
Fear of meeting people
Feelings of shame and discrimination
Lapses in tact and irritability
Loss of consideration
Demanding behavior
Indifference
Immaturity
*Egocentrism and lack of empathy
Difficulties emphasizing with others
Extremely self-interested
*Immaturity in social-emotional development
Emotional immaturity
Superinsensitivity
Inappropriate emotions
Unrealistic fears
Deficient emotional acceptability
Social immaturity
Maladaptive behavior
More rigid behavior
Less adequate relations
Impoverished relations
Uncertainty as to consequence of one's behavior
Need to be dependent on others
Helplessness
Emotional dependence on others
Symbiotic parent-child relationships
Limited independent living
Dependence on others for intimate aspects of personal hygiene
Dependency conflicts
Mutual hostility dependency
Dependency & help-seeking conflicts
Fear of dependency, loss of independence

Figure 3-6 (continued-A). Tree diagram for social/attitudinal needs



Negative attitudes toward non-disabled
Suspicious and blaming others attitude
Envy, resentment
Aggressiveness and hositility
Belligerance
Outburst of temper
Overt hostility
Physical violence and crime
Unprovoked acts of physical aggression
Delusional jealousy with attacks on spouse
Inordinate number of epileptic and mentally retarded persons
Violent and sexually deviant criminal activities
Marriage problems
Concern about effect of loss of libido on marriage partner
Divorce
Inability to function appropriately sexually
Sexual fears and psychologically rooted dysfunctions
Limited contact with members of opposite sex
Fear of intercourse
Inability to relate effectively with opposite sex
Withdrawal of sexual interest
Lack of sexual knowledge
Abnormal sexual behaviors
Acting out of unrestrained sexual urges
Homosexuality
Promiscuity

Figure 3-6 (continued-B). Tree diagram for social/attitudinal needs

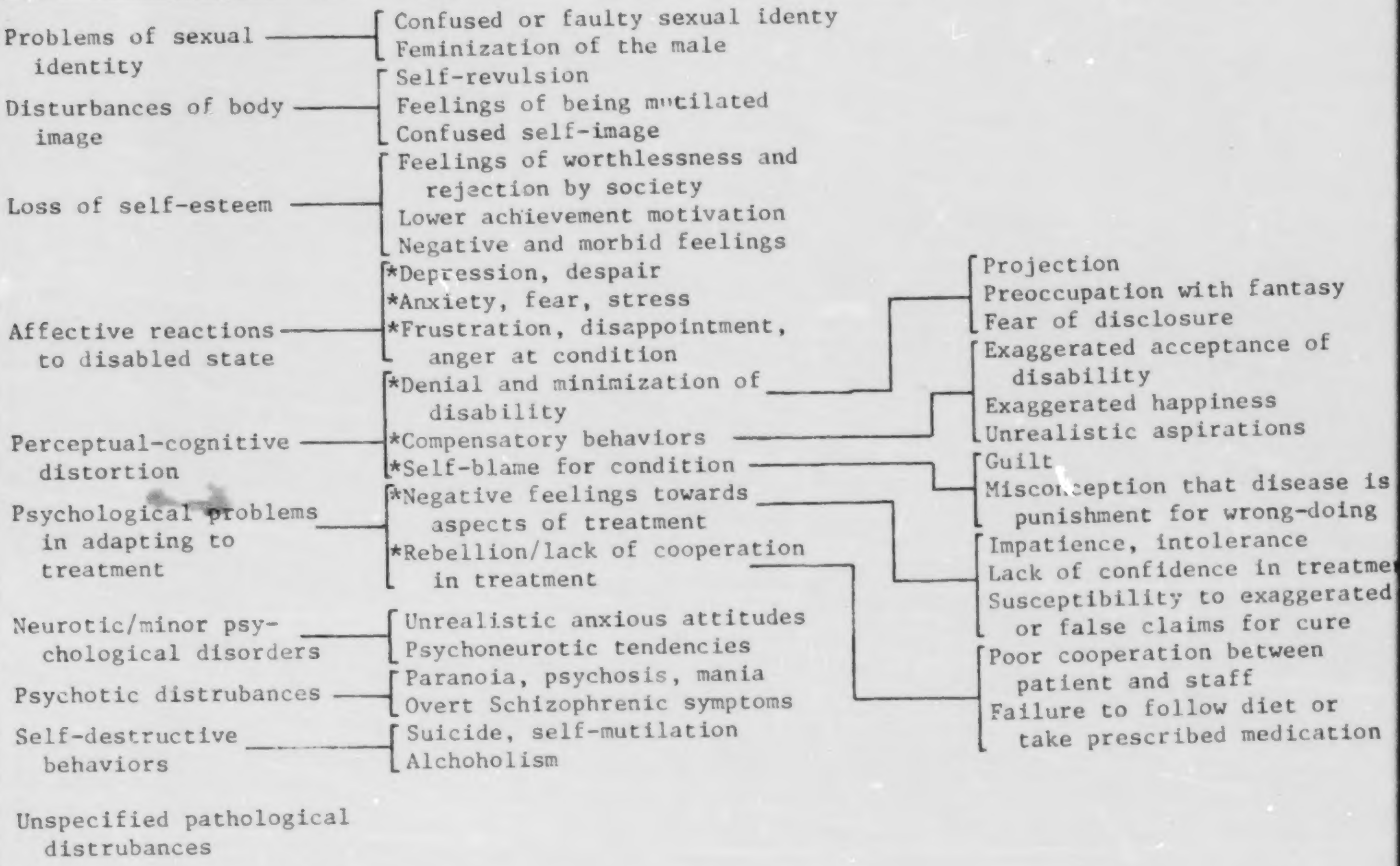

Problems of sexual identity
Confused or faulty sexual identy
Feminization of the male
Disturbances of body image
Self-revulsion
Feelings of being mutilated
Confused self-image
Loss of self-esteem
Feelings of worthlessness and rejection by society
Lower achievement motivation
Negative and morbid feelings
Affective reactions to disabled state
*Depression, despair
*Anxiety, fear, stress
*Frustration, disappointment, anger at condition
Perceptual-cognitive distortion
*Denial and minimization of disability
Projection
Preoccupation with fantasy
Fear of disclosure
*Compensatory behaviors
Exaggerated acceptance of disability
Exaggerated happiness
Unrealistic aspirations
*Self-blame for condition
Guilt
Misconception that disease is punishment for wrong-doing
Psychological problems in adapting to treatment
*Negative feelings towards aspects of treatment
Impatience, intolerance
Lack of confidence in treatme
Susceptibility to exaggerated or false claims for cure
*Rebellion/lack of cooperation in treatment
Poor cooperation between patient and staff
Failure to follow diet or take prescribed medication
Neurotic/minor psychological disorders
Unrealistic anxious attitudes
Psychoneurotic tendencies
Psychotic distrubances
Paranoia, psychosis, mania
Overt Schizophrenic symptoms
Self-destructive behaviors
Suicide, self-mutilation
Alchoholism
Unspecified pathological distrubances

Figure 3-6 (continued-C). Tree diagram for social/attitudinal needs

NEEDS CONSTELLATIONS

Within each life-function tree, specific areas are identified as "needs constellations." Each need constellation is marked by an asterisk in the diagrams. The needs constellations represent major problem areas for one or more disability groups. They have been identified because they represent areas of need general enough to cut across several disability groupings but specific enough to permit inference of concrete problems within the life-function area.

The needs constellations for each of the life-function areas are listed separately in tables 3-2 through 3-6, along with the number of needs statements falling within each constellation for each of the 14 representative disabilities. The total number of needs statements for each disability group is also given, as is the percentage of the total number of needs statements that fall within each needs constellation. These tables illustrate the similarity of needs among the various disability groups. They also show that within a specific life-function area, particular disability groups are likely to have multiple needs. These tables neither indicate the relative strength of particular needs nor represent the percentages of a particular disability group for whom a need is present. These tables represent only the number of different needs which are reported in research sources. However, because of differences in the amount of research information pertaining to various disability groups, the needs data cannot be used for relative severity of handicaps among these disability groups.

GENERAL TRENDS IN LIFE-FUNCTION NEEDS

The needs constellation tables show general trends in the life-function needs of all disability groups in terms of percentages of needs statements falling within each of the life-function areas. These percentages are given in table

TABLE 3-2
NEED CONSTELLATION TABLE--MOBILITY

NEED CONSTELLATION TABLE--MOBILITY

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. INTERFERENCE WITH VOLUNTARY MOVEMENTS	5	2	6		2		1				1				17
2. EXCESSIVE INVOLUNTARY MOVEMENT	4	3	7	2							1				17
3. HYPERACTIVITY				1		2									3
4. KINESTHETIC MOTOR REACTIONS AND PERCEPTION DIFFICULTIES	1		2		1	1							1	3	9
5. PROBLEMS IN COORDINATING BODY MOVEMENTS	1	3	1	1	4	1							4		15
6. DIFFICULTIES IN FINE MOTOR CONTROL AND TACTILE PERCEPTION	6	3	1	1	1		4						1		17
7. BALANCE PROBLEMS	1		1	1		1					2			3	9
8. TONAL ABNORMALITIES, ATROPHY, WEAKENING OF MUSCLES	4	1	2	1		2	1				2				13
9. JOINT PROBLEMS	1		1				8				3				13
10. POSTURAL ABNORMALITIES	3		4		1										8
11. PARALYSIS OR LACK OF MOVEMENT	4	4	1	2		2									13
12. INABILITY OR LIMITED ABILITY TO WALK	1	1	1		4		3				3	1	1		15
13. GAIT PROBLEMS AND FALLS	3		6										1	1	11
14. LIMITATIONS IN RECREATION AND PHYSICAL EXERTION		1			2			2			3	2	1		11
15. DIFFICULTIES DUE TO ENVIRONMENTAL OBSTACLES	3	8					2						1		14
16. DIFFICULTIES IN MANAGING VEHICLE TRANSPORTATION	1	3			1			2	1						8
17. ACTIVITIES OF DAILY LIFE IN THE HOME (LIMITATIONS OF)	4	15	2					7							28
TOTAL	42	44	35	9	16	9	26	4	1		15	3	10	7	221

Key to Disability Codes

ST=Stroke	MR=Mental Retardation	EM=Emphysema	VI=Visual Impairment
SCI=Spinal Cord Injury	SZ=Zchizophrenia	CRC=Colon/Rectum Cancer	HI=Hearing Impairment
CP=Cerebral Palsy	RA=Rheumatoid Arthritis	KD=Kidney Disease	
EP=Epilepsy	CHD=Coronary Heart Disease	DM=Diabetes Mellitus	

TABLE 3-3
NEED CONSTELLATION TABLE--HEALTH

NEED CONSTELLATION TABLE--HEALTH

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. FATIGUE AND SLEEP DISTURBANCES	1		3	4		2	1	1	3	1	4				20
2. THREATS TO NORMAL SYSTEM FUNCTIONING		4	1		1	2	4		2	4	6	5	1	2	32
3. SENSATION DISCOMFORTS AND INTERFERENCE	10	2	4	2		2	8	1	2	2	5				38
4. ENVIRONMENTAL DISCOMFORTS-NEED FOR CONTROL		1						1	3	1	3	1			10
5. DEVELOPMENTAL PHYSICAL DEFORMITIES				1	2	1					4				8
6. GROWTH RATE RETARDATION						1	2				3				6
7. EARLY MORTALITY		1		1	2			1		2		1			8
8. BRAIN DISORDERS	3		1	1	2						3			1	11
9. SPINAL CORD DISORDERS		5					1				2	1			9
10. GENERALIZED CENTRAL NERVOUS SYSTEM DISORDERS											1		1		2
11. BLOOD DISORDERS		1		4			3		2	1	5	1		1	18
12. HEART DISORDERS	1	1		1	1		2		3		2			1	12
13. DISORDERS OF THE ARTERIES AND VEINS	1						3	2	1	1	6	1	1		16
14. DISORDERS OF THE DIGESTIVE ORGANS				1			1		2		6				10
15. DIGESTIVE DISORDERS	1		1	1			2		2		4	1			12
16. DIETARY PROBLEMS				1	1	2				1	1				6
17. KIDNEY DISORDERS		5		1							3	2			11
18. URINARY TRACT DISORDERS	2	4					1				8	4			19
19. INTESTINAL DISORDERS		1								9	6				16
20. PERSPIRATION PROBLEMS		1					1				1	1			4
21. METABOLIC DYSFUNCTION	1			1	1		2			1	3	2	1		12
22. MALFUNCTIONING OF REPRODUCTIVE ORGANS		3				2	3			1	6	1			16
23. SEXUAL AND REPRODUCTIVE LIMITATIONS		1				1	1	1			2	2			8
24. LUNG DISEASES	1				3						3				7
25. OTHER DIFFICULTIES IN VENTILATION	3	1		2				1	4		1				12
26. BONE DYSFUNCTIONING	1	5		1			2				4	1			14
27. DENTAL PROBLEMS			1		1						2				4
28. SKIN DISORDERS	1	1		4	1		8			1	8				24
29. GENERALIZED TISSUE DISORDERS	3	1		2			6			2	6	1			21
TOTAL	29	38	11	28	15	13	51	8	24	27	108	25	4	5	386

*See Key to Disability Codes, Table 3-2

TABLE 3-4
NEED CONSTELLATION TABLE--COMMUNICATION

NEED CONSTELLATION TABLE--COMMUNICATION

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. HEARING	1		2	1	1	4								22	31
2. BLINDNESS AND REFRACTORY TYPE ERRORS	2		3	1	1						3	2	10	2	24
3. OCULAR DISEASES							4				4	1			9
4. EYE MUSCLE ABNORMALITIES	1		5	2		1							5		14
5. SPATIAL DEFICIENCY			2			3							2		7
6. MULTIPLE SENSORY INTEGRATION PROBLEMS			1	1		1									3
7. READING					1									1	4
8. WRITING						1					1			2	4
9. NON-VERBAL COMMUNICATION	1														1
10. SPEECH IDIOSYNCRACIES IN CONTENT AND STYLE					2	12							1		15
11. DEFICITS IN LANGUAGE SKILLS	1		1		7	1									10
12. ARTICULATION AND OTHER SPEECH DEVIATIONS			5	1	2								1	4	13
13. VOCALIZATION DISTURBANCES ASSOCIATED WITH MUSCLE DYSFUNCTION OR PARALYSIS	4		4		1	2									11
14. APHASIA	3		1		2										6
TOTAL	13		24	6	19	25	4				8	3	19	31	152

Key to Disability Codes

ST=Stroke
SCI=Spinal Cord Injury
CP=Cerebral Palsy
EP=Epilepsy
MR=Mental Retardation
SZ=Schizophrenia
RA=Rheumatoid Arthritis
CHD=Coronary Heart Disease
EM=Emphysema
CRC=Colon/Rectum Cancer
KD=Kidney Disease
DM=Diabetes Mellitus
VI=Visual Impairment
HI=Hearing Impairment

TABLE 3-5
NEED CONSTELLATION TABLE-- COGNITIVE-INTELLECTUAL

NEED CONSTELLATION TABLE--COGNITIVE-INTELLECTUAL

NEED CONSTELLATION	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. DEPRESSED PERFORMANCE ON STANDARDIZED IQ TEST			1	9	1	4							1	2	18
2. VOCABULARY DEFICITS						2							2		4
3. ACADEMIC PERFORMANCE DEFICITS				4	5						1		1		11
4. STIMULUS PROCESSING AND ATTENTIONAL DEFICITS	1		1	4	7	11						1		2	27
5. SENSORY RECEPTIVITY DEFICITS			1		4										5
6. CAPACITY AND STORAGE DEFICITS	1			2	1									2	6
7. CONSOLIDATION/RETRIEVAL DEFICITS				3	2	4			1		1		1		12
8. DEFICITS IN ACQUISITION OF NEW MATERIAL	1			4	6	1			1	1				1	15
9. DEFICITS IN TRANSFER LEARNING					4									1	5
10. DEFICITS IN LEVEL OF THINKING AND REASONING (ABSTRACTNESS)			1		1							4	1		7
11. DEFICITS IN FUNCTIONING OF REASONING AND THOUGHT PROCESS	4			6	2	6								2	20
12. PATHOLOGICAL THOUGHT CONTENT	1					6					1				8
13. PATHOLOGICAL THOUGHT PROCESS	1		1			6					1				9
TOTAL	9		5	32	33	40			2	1	4	5	6	10	147

Key to Disability Codes

ST=Stroke
SCI=Spinal Cord Injury
CP=Cerebral Palsy
EP=Epilepsy

MR=Mental Retardation
SZ=Schizophrenia
RA=Rheumatoid Arthritis
CHD=Coronary Heart Disease

EM=Emphysema
CRC=Colon/Rectum Cancer
KD=Kidney Disease
DM=Diabetes Mellitus

VI=Visual Impairment
HI=Hearing Impairment

TABLE 3-6
NEED CONSTELLATION TABLE--SOCIAL-ATTITUDINAL

NEED CONSTELLATION TABLE--SOCIAL-ATTITUDINAL

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. SOCIAL ISOLATION	1		1		2	1	1			1	3	1		4	15
2. WITHDRAWAL AND FEAR OR RELATIONSHIP	1	4	1			5	2			1	1			3	18
3. LAPSES IN TACT AND IRRITABILITY	3	2	1			1			1		3				11
4. EGOCENTRISM AND LACK OF EMPATHY	1			1		2							1	2	7
5. IMMATURITY IN SOCIAL - EMOTIONAL DEVELOPMENT		3		6	3	2					2	1	1	7	25
6. DEPENDENCY AND DEPENDENCY CONFLICTS	1	1		1	3	2	3				5		2	1	19
7. NEGATIVE ATTITUDES TOWARD NON-DISABLED	1	1	1	1			2			1					7
8. AGGRESSIVENESS AND HOSTILITY	1	2		3			3				1	1	1	1	13
9. PHYSICAL VIOLENCE AND CRIME	1	1		3	1										6
10. DIFFICULTY IN SEXUAL RELATIONSHIPS		2		1	3	4					3				13
11. PROBLEMS OF SEXUAL IDENTITY		1				1	1	1			2				6
12. DISTURBANCES OF BODY IMAGE		2					1			1	2				6
13. LOSS OF SELF-ESTEEM	2	7		1	4	2		1	1		1		1	1	21
14. DEPRESSION, DESPAIR	2	2	1	2		1	2	1	1	1	2	1			16
15. ANXIETY, FEAR, STRESS	2	3		4	2		2	1		2	3	1	1	1	22
16. FRUSTRATION, DISAPPOINTMENT, ANGER AT CONDITION	2	2		2			5	2		1	1				15
17. DENIAL AND MINIMIZATION OF DISABILITY		4	1				1	5				1		1	13
18. COMPENSATORY BEHAVIORS		5				1	1			1				1	9
19. SELF-BLAME FOR CONDITION	1	2					1				1	1	1		7
20. NEGATIVE FEELINGS TOWARD ASPECTS OF TREATMENT	1	1					1			1	11	1			16
21. REBELLION/LACK OF COOPERATION IN TREATMENT				1	1						3	2	1		8
22. NEUROTIC MINOR PSYCHOLOGICAL DISORDERS		5		2		2		1			2			2	14
23. PSYCHOTIC DISTURBANCES	4	1		3		1	1				1			2	13
24. UNSPECIFIED PATHOLOGICAL DISTURBANCES	2			1	1						2	1			7
25. SELF-DESTRUCTIVE BEHAVIORS		1		1	2	2				1	1	1			9
TOTAL	26	52	6	34	22	27	27	12	3	11	50	12	9	26	316

*See Key to Disability Codes, Table 3-5

3-7. As shown in this table, most needs statements--32 percent of them--occur in the area of health. Slightly fewer--26 percent--relate to social-attitudinal functioning, followed by 18 percent relating to mobility and 12 percent each relating to cognitive-intellectual functioning and communication.

Analysis of tables 3-2 through 3-7 reveals that no disability group has needs restricted to just one life-function area, although some disability groups have more needs in one life-function area than in another. It is also apparent that the majority of the disabilities have at least some needs in each of the life-function areas. Moreover, a close examination of the tables indicates that life-function impairments in one area are frequently interrelated with life-function impairments in another area. For example, a person with mobility restrictions is often affected in the social-attitudinal area by his being depressed about his mobility impairment. Disability, as the needs constellation tables clearly show, has complex and multiple effects on functioning.

SIMILARITY OF NEEDS AMONG DISABILITY GROUPS

Conclusions about the extent to which certain classes of disabilities exhibit similar life-function needs are also indicated by the needs constellation tables. Table 3-7 shows the similarity of needs patterns within four general classifications: *motor disabiliites*, *behavioral disabilities*, *chronic diseases*, and *sensory disabilities*.

Motor Disabilities

The "motor-disabilities" classification includes spinal-cord injury, stroke, and cerebral palsy. Because these disabilities often result in paralysis or loss of motor control, for all three groups, the highest percentage of needs statements falls within the mobility area. Similarly, for all

TABLE 3-7
SUMMARY OF PERCENTAGE OF NEED STATEMENTS IN EACH LIFE FUNCTION BY DISABILITY

LIFE FUNCTION	MOTOR			BEHAVIORAL			CHRONIC DISEASE						SENSES		TOTAL	
	SCI	ST	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	#
HEALTH	28	24	14	26	14	11	47	33	80	69	58	52	7	7	32	386
SOC-ATT	39	22	06	31	21	24	25	50	10	28	27	25	38	15	26	316
MOBILITY	33	35	44	08	16	08	24	17	03	0	08	06	13	17	18	221
COG-INTELL	0	08	06	29	31	35	0	0	07	03	02	10	13	10	12	147
COMM	0	11	30	06	18	22	04	0	0	0	04	06	28	53	12	152
															TOTAL	1222

ABBREVIATIONS FOR THE FOURTEEN CASE STUDY DISABILITIES

SCI=Spinal Cord Injury
ST=Stroke
CP=Cerebral Palsy
EP=Epilepsy
MR=Mental Retardation
SZ=Schizophrenia
RA=Rheumatoid Arthritis

CHD=Coronary Heart Disease
EM=Emphysema
CRC=Colon/Rectum Cancer
KD=Kidney Disease
DM=Diabetes Mellitus
HI=Hearing Impairment
VI=Visual Impairment

three groups, the lowest percentage of need statements occurs within the cognitive-intellectual area. The importance of health needs for the three groups is also very similar, with health needs ranking second for stroke and third for spinal-cord injury and cerebral palsy. Although during the initial period of their affliction, persons with spinal-cord injury have numerous health problems, in later stages, the major needs of this group are social-attitudinal--relating to emotional and interpersonal problems.

Behavioral Disabilities

The case-study disabilities classified as "behavioral disabilities" also evidence several similarities in patterns of life-function needs as shown in table 3-7. This classification includes mental retardation, schizophrenia, and epilepsy. Social-attitudinal and cognitive-intellectual needs are the most numerous, and mobility needs are relatively few.

Chronic Diseases

Similarity of life-function needs is likewise characteristic of the disabilities classified as "chronic disorders," including coronary heart disease, emphysema, colon or rectum cancer, kidney disease, and diabetes mellitus. As shown in table 3-7, for all of these groups except coronary heart disease, the highest percentage of needs statements occurs in the health life-function. For the coronary heart disease group, the highest percentage of needs relate to social-attitudinal functioning, with health needs ranking second. For the other groups, social-attitudinal needs rank second to health needs. Among all of the chronic disorders, however, health needs and social-attitudinal needs are clearly more numerous than any of the other life-function needs. Predictably none of the chronic disease groups show many needs in the communications life function or in the cognitive-intellectual life function.

Sensory Disabilities

For the disabilities classified as "sensory disabilities"--visual impairment and hearing impairment--as shown in table 3-7, communication needs rank very high (first for the visually impaired and second for the hearing impaired), with the visually impaired having the highest percentage of needs in this area of any of the 14 disability groups. The lower percentage of communication needs statements among the hearing impaired does not, however, necessarily indicate that the communication needs of this group are less significant than are those of the visually impaired. One reason for such an apparent discrepancy is that the needs constellation tables could not be weighted according to the relative strengths of expressed needs. Therefore, a lower percentage of needs statements in a particular area cannot be interpreted as a lesser degree of importance of the need within the affected group. A similar discrepancy in the social-attitudinal needs of the visually impaired and of the hearing impaired is shown in table 3-7, with the hearing impaired having a much higher percentage of need statements in this life-function than do the visually impaired. In addition, the hearing impaired are shown to have more social-attitudinal needs than communications needs. Difficulties in assessing the severity of particular needs partially account for such results. However, as noted in the disability analysis of hearing impairment, persons in this group are frequently characterized by emotional immaturity and are limited in social interaction by a lack of oral communication skills. Because of these factors, the hearing impaired exhibit a pattern of social-attitudinal needs similar to the three representative case-study disabilities classified as "behavioral disorders."

DISTRIBUTION OF NEEDS WITHIN LIFE-FUNCTIONS AREAS

The concentration of needs within specific life-function areas is particularly apparent when results from the needs-constellation tables are summarized as shown in table 3-8. In this table, the average percentage of needs attributable to each of the five life functions within each of the four broad classes of disabilities are listed. Such a summary of the information leads to the following list of general observations.

TABLE 3-8
AVERAGE PERCENTAGE OF STATEMENTS IN EACH LIFE FUNCTION FOR FOUR MAJOR DISABILITY CLASSES

Health	Motor	21	Health Life Function, primarily for chronic diseases
	Behavioral	17	
	Chronic	56	
	Sensory	7	
Social-Attitudinal	Motor	22	Social-Attitudinal, a major need across all disabilities
	Behavioral	25	
	Chronic	27	
	Sensory	26	
Mobility	Motor	39	Motor disability
	Behavioral	11	
	Chronic	10	
	Sensory	15	
Cognitive-Intellectual	Motor	5	
	Behavioral	32	Behavioral disability
	Chronic	4	
	Sensory	12	
Communication	Motor	14	Sensory
	Behavioral	15	
	Chronic	2	
	Sensory	40	

1. Health needs predominate among persons with chronic diseases, but these needs are also of considerable importance to persons with motor and behavioral disabilities.
2. Social-attitudinal needs are present to an approximately equal extent for all categories of disabilities. This apparently universal prevalence of a significant percentage of social-attitudinal needs represents a major area in which programs initiated could benefit persons throughout the entire spectrum of disability.
3. Mobility needs are most prevalent among persons with motor disabilities, but mobility problems are evident to some extent within all of the classifications of disabilities.
4. Cognitive-intellectual needs are most extensive among persons with behavioral disorders, and they are relatively rare among persons with motor disorders and chronic diseases.
5. Communication needs, predictably, are very great for persons with sensory disabilities, but only persons in the chronic disease category are relatively free of communication problems.

SIGNIFICANT FINDINGS WITHIN INDIVIDUAL LIFE-FUNCTION AREAS

The needs-constellations are extremely helpful in identifying, with a fairly high degree of specificity, particular needs associated with particular disorders. However, a classification of these needs into broader categories yields a more workable means of analyzing the characteristics of the needs within each life-function area. The following sections of this chapter present needs data according to broad categories of need within each life-function area. Tables within these sections present graphic indication of the presence of needs statements (an "X" in the square) in a particular category is given, rather than actual counts of needs statements. Percentages of needs statements within each category are, however, reported.

FINDINGS RELATING TO MOBILITY

Needs within the mobility life-function area, as shown in table 3-9 fall into two major classification: 1) needs associated with physiological motor difficulties, and 2) needs associated with difficulties in performing daily activities and negotiating environments. The types of needs associated with physiological motor difficulties include those arising from paralysis and poor muscle tone, from problems with joints and posture or from structural involvement of the motor system, from uncontrolled movement and hyperactivity, from problems with fine motor control and kinesthetic and tactile perception, and from problems with coordination and balance. Needs associated with difficulties in performing daily activities and negotiating environments include those arising from limitations in ambulation and physical activities and from limitations on exertion, mobility outside the home, and activities of daily life.

The needs associated with physiological motor difficulties are, in general, related to basic impairments, whereas, the needs associated with difficulties in performing daily activities and negotiating environments are related to handicapping factors resulting from the interaction between a person and the environment. Because the extent of a handicap is often due to environmental factors, elimination of these factors is a particularly effective means of counteracting the effects of disability.

The extent of mobility problems, as shown in table 3-9, differs among the broad disability categories; however, there is considerable similarity within each broad category.

Motor Disabilities

Persons with motor disabilities have extensive needs in both major mobility areas. As shown in table 3-9, among the motor disabilities, all but stroke are shown to be affected

TABLE 3-9
MOBILITY NEED STATEMENTS IN NEED-CONSTELLATION "CLUSTERS" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL %	NO. OF DISABILITY GROUPS AFFECTED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI		
Physiological Motor Difficulties	1. Paralysis & muscle tone	X	X	X		X	X	X				X				12	7
	2. Joints & Posture: Structural Involvement of Motor System		X	X	X			X				X				10	5
	3. Uncontrolled movements and hyperactivity	X	X	X	X	X	X	X				X				17	8
	4. Fine Motor Control & Kinesthetic & Tactile Perception	X	X	X	X	X	X	X						X	X	11	9
	5. Coordination & Balance	X	X	X	X	X	X					X		X	X	10	9
Difficulties in Performing Daily Activities & Negotiating Environments	6. Limitations in Ambulation & Physical Activities	X	X	X	X			X				X	X	X	X	12	9
	7. Limitations on Exertion, Mobility Outside the Home & Activities of Daily Life	X	X	X	X			X	X	X		X	X		X	28	10
																100	

Total # of Need Statements 221

in *all* of the needs categories, and stroke victims are unaffected in only one of the seven areas, the "joints and posture" area.

Behavioral Disabilities

As shown in table 3-9, persons with behavioral disabilities have a great number of needs associated with physiological difficulties, but only the mentally retarded also have mobility needs related to daily activities and negotiating the environment.

Chronic Diseases

Among persons with chronic diseases, as shown in table 3-9, those with rheumatoid arthritis and kidney disease have mobility limitations in most of the categories. Mobility problems do not affect the other chronic disease groups as pervasively; however, limitations in performing daily activities and negotiating environments are reported for persons afflicted by emphysema, coronary heart disease, and diabetes mellitus.

Sensory Disabilities

Persons afflicted with sensory disabilities have needs associated with both physiological problems and problems in daily activities and negotiating the environment, as shown in table 3-9. However, the limitations associated with physiological difficulties are not as numerous for persons with sensory disabilities as they are for persons with motor disabilities. Among persons with sensory disabilities, the needs associated with physiological limitations are related to coordination and balance, fine motor control, and kinesthetic and tactile perception--all problems arising directly from sensory-organ impairments. Mobility problems associated with environmental factors are characteristic of both the visually impaired and the hearing impaired, particularly among persons with severe impairments.

Generalizations

As shown in table 3-9, 60 percent of all mobility needs are associated with physiological motor difficulties. However, approximately two thirds of the 14 representative disabilities also have significant needs related to limitations in ambulation, mobility outside the home, and activities of daily life. Moreover, although the highest percentage of mobility needs overall is related to physiological limitations, the highest percentage of needs statements with any one category falls in the area of limitations on exertion, mobility outside the home, and activities of daily life. These environmentally-determined mobility needs often arise because of societal unawareness of or indifference to environmental barriers to mobility. Elimination of such barriers would, to a large extent, eliminate many of the life-function needs of the disabled in the area of mobility within the environment.

FINDINGS RELATING TO HEALTH

The health life-function area encompasses a great number of specific impairments affecting a wide range of disability groups. Among all 14 representative disability groups, the greatest number of needs statements (386) relate to health, and as shown in table 3-10, all 14 disability groups have needs in many categories, and each category contains needs statements from seven or more of the disability groups.

Health needs fall into two major categories: 1) disruptions of normal body processes, and 2) abnormalities of specific body systems. As depicted in table 3-10, disruptions

TABLE 3-10
HEALTH NEED STATEMENTS IN NEED-CONSTELLATION "CLUSTERS" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS AFFECTED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	
Disruptions of Normal Body Processes	1. Strains upon the organism	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14	14
	2. Discomfort to the organism	X	X	X		X	X	X	X	X	X	X	X			12	11
	3. Abnormalities of the organism & interruptions of the normal life cycle		X		X	X	X	X	X		X	X	X			6	9
Abnormalities of Specific Body Systems	4. Abnormalities of specific structural components	X	X	X	X	X		X			X	X	X			16	9
	5. Central Nervous System	X	X	X	X	X		X				X	X	X	X	6	10
	6. Circulatory System Disorders	X	X		X	X		X	X	X	X	X	X			12	12
	7. Digestive System Disorders	X	X	X	X	X	X	X		X	X	X	X			7	10
	8. Excretory System Disorders	X	X			X		X			X	X	X			13	7
	9. Metabolic Disorders	X			X	X		X			X	X	X		X	3	8
	10. Reproductive System Disorders		X				X	X	X		X	X				6	7
	11. Respiratory System Disorders	X	X		X	X			X	X		X				5	7
																100	

Total # of Need Statements 386

of normal body processes include generalized impairments that tend to debilitate the entire body: strains upon the organism (such as fever and shock); discomforts to the organism; and abnormalities of the organism and interruptions of the normal life cycle. Abnormalities of specific body systems include specific impairments resulting from disease or organ disorders: abnormalities of specific structural components; disorders of the various body systems, including the central nervous system, the circulatory system, the digestive system, the excretory system, the reproductive system, and the respiratory system; and metabolic dysfunctions.

Although a distinct pattern of needs is discernable within the "sensory disability" category, for most classifications of disabilities, health needs are so pervasive that pervasiveness is the most distinctive "pattern" that emerges.

Motor Disabilities

Table 3-10 shows that among persons with motor disabilities, the group with health needs in the fewest categories is the cerebral-palsy group, with needs in five of the 11 categories. The other two motor-disability groups, stroke and spinal-cord injury, each have needs in nine of the 11 health categories, with many of these needs related to abnormalities of specific body systems.

Behavioral Disabilities

Table 3-10 shows that among persons with behavioral disabilities, there is a very high percentage of health-related problems. Only the schizophrenia group has needs in fewer than half of the categories. Schizophrenia shows needs in all three of the categories related to disruptions of normal body processes, but it shows needs in only two of the eight categories related to abnormalities of specific body systems.

The epilepsy group, by contrast, has health needs in every category except reproductive system disorders. Similarly, the mentally retarded group has needs in every category except discomforts to the organism, disorders of the excretory system, and disorders of the reproductive system.

Chronic Diseases

Among persons with chronic diseases, disruptions in normal body processes, as shown in table 3-10, give rise to a great many needs. All except the emphysema group have needs in every category relating to disruptions in normal body processess.

As shown in table 3-10, the four chronic disease groups with the greatest variety of health needs are the kidney-disease group, the rheumatoid-arthritis group, the diabetes-mellitus group, and the colon/rectum cancer group. Persons with kidney disease have the greatest variety of health needs of all 14 disability groups, with needs reported in all 11 categories. For persons with rheumatoid arthritis, needs are reported in every category except respiratory-system disorders. For persons with diabetes mellitus, needs are reported in every category except reproductive system disorders and respiratory-system disorders. For persons with colon/rectum cancer, needs are reported in every category except central-nervous-system disorders and respiratory-system disorders.

Within the chronic-disease classification, table 3-10 shows that the groups having needs in the fewest categories are the coronary heart disease group (6) and the emphysema group (5). Both of these groups have needs in fewer (only three for each) of the categories related to abnormalities of specific body systems than do other chronic-disease groups.

Sensory Disabilities

As shown in table 3-10, persons with sensory disorders have health needs in fewer categories than do persons in any of the other broad disability classifications. Both the hearing impaired and the visually impaired experience needs related to strains upon the organism, central nervous-system disorders, and circulatory-system disorders, but the only other types of needs associated with sensory disorders are related to metabolic dysfunctioning, and these are experienced by only the visually impaired.

Generalizations

Within the health life-function area, table 3-10 shows that abnormalities of specific body systems account for a larger percentage of total needs statements (68 percent) than do disruptions of normal body processes. However, disruptions of normal body processes are reported for a larger number of disability groups.

FINDINGS RELATING TO COMMUNICATION

Communication needs fall into two broad classifications: 1) limitations in receptive capacities, and 2) limitations in expressive capacities. As depicted in table 3-11, receptive limitations include limitations in hearing, limitations in sight, and limitations in other types of sensory processing. Expressive limitations include limitations in writing and other expressive communication modes and limitations in speech and language skills.

Table 3-11 shows that communication problems are concentrated within specific broad disability classifications.

TABLE 3-11
COMMUNICATION NEED STATEMENTS IN NEED-CONSTELLATION (AREAS) BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL %	NO. OF DISABILITY GROUPS AFFECTED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI		
Receptive	1. Hearing	X		X	X	X	X							X		20	6
	2. Sight	X		X	X	X	X	X				X	X	X	X	36	10
	3. Sensory processing problems other than sight and hearing			X	X	X	X							X		5	5
Expressive	4. Writing & other expressive comm. modes	X					X							X	X	3	4
	5. Speech & language skills	X		X	X	X	X					X		X	X	36	8

100

Total # of Need Statements 152

Motor Disabilities

As shown in table 3-11, communication needs among persons with motor disabilities occur only among those with stroke and cerebral palsy. No communication needs are reported for persons with spinal cord injury. Among the stroke group, communication difficulties are experienced in every category except sensory processing problems other than sight and hearing. Among the cerebral-palsy group, communication difficulties are experienced in every category except writing and other expressive communication modes. Overall, persons afflicted bv stroke seem to have more difficulties associated with expression, and persons afflicted by cerebral palsy seem to have more difficulties related to reception.

Behavioral Disabilities

Communication difficulties are very widespread among persons with behavioral disabilities. As shown in table 3-11, needs in every category related to reception are reported for all behavioral disability groups. Additionally with the schizophrenia group needs are reported in every category related to both reception and expression.

The communication needs of the mentally retarded and epileptic groups are concentrated in the receptive area, with needs in the expressive area limited to difficulties related to speech and language skills.

Chronic Diseases

Persons afflicted with chronic diseases have very few communication needs. As shown in table 3-11, within this disability classification, the only groups for which communication needs are reported are the rheumatoid arthritis group, the kidney disease group, and the diabetes mellitus group. Only sight limitations are reported for the rheumatoid arthritis group and the diabetes mellitus group, while for the kidney disease group, both sight limitations and limitations in speech and language skills are reported.

Sensory Disabilities

As shown previously in the needs constellation tables, communication needs are numerous among persons with sensory disabilities. Table 3-11 shows the hearing impaired to have needs in every category in the communication life-function area. The visually impaired have needs in both of the expressive categories, but within the receptive area, the needs of this group are related only to limitations in sight.

Generalizations

Within the communication life-function area, as shown in table 3-11, 61 percent of the total needs statements fall within the receptive grouping. This concentration indicates that, in general, receiving input constitutes a greater problem for disabled persons than does sending output. Moreover, one category of needs within the receptive grouping, sight limitations, accounts for 36 percent of the total communications needs statements and affects 10 of the 14 disability groups. Such a widespread distribution and such a high percentage of needs statements relating to sight might be interpreted as evidence that visual impairments are more handicapping than are hearing impairments. The importance of these receptive problems should not be underestimated in the planning and design of new technologies for communication rehabilitation. For if a person does not receive signals correctly, he can neither interpret nor respond to his environment correctly.

Expressive communication needs are heavily concentrated in the category of limitations in speech and language skills. This category of need accounts for 36 percent of all needs statements in the communication life-function area (the same percentage attributable to sight limitations), and eight of the 14 disability groups are affected by such needs. Because of the decline in written communication and the corresponding increase in oral communication, limitations in speech and language skills may be severely handicapping for disabled persons.

Overall, there are relatively few (152) needs statements within the communication life-function area. Nonetheless, because of the impediment communication difficulties pose to social interaction, the inability to effectively send and receive information must be viewed as a severe handicap.

FINDINGS RELATING TO COGNITIVE-INTELLECTUAL FUNCTIONING

The cognitive-intellectual life-function area includes five general categories of needs statements relating to the following limitations: 1) deficits in general measured intellectual functioning, 2) deficits in perceptual functioning, 3) deficits in memory functioning, 4) deficits in learning functioning, and 5) deficits in reasoning and thought-processing functioning.

Cognitive-intellectual limitations are not as widespread throughout the spectrum of disabilities as are most other life-function needs. However, as shown in table 3-12, there is a very high concentration of cognitive-intellectual needs among certain disability groups.

Motor Disabilities

Within the motor disabilities classification, the widest distribution of cognitive-intellectual needs, as shown in table 3-12, is in the stroke group, followed by the cerebral palsy group. No cognitive-intellectual needs are reported for the spinal-cord injury group. For the stroke group, needs are reported in every category except in deficits in general measured intellectual functioning. For the cerebral palsy group, needs are reported in three of the five categories: general measured intellectual functioning, perceptual functioning, and reasoning and thought processing functioning.

Behavioral Disabilities

As shown in table 3-12, cognitive-intellectual needs are most heavily concentrated among persons in the behavioral disability group, with needs reported in all categories for all three behavioral disabilities. That similar needs are present for all three groups suggests that this classification of disability may be readily served within the same service-delivery program.

Cognitive Disabilities

Cognitive-intellectual needs within the chronic-disease classification, as shown in table 3-12, are not extensive and do not fall into any discernable pattern. Two disabilities, rheumatoid arthritis and coronary heart disease, are apparently free of cognitive-intellectual needs. The chronic-disease disability group having the greatest variety of cognitive-intellectual needs is the kidney-disease group. The needs of this group are related to deficits in general measured intellectual functioning, deficits in memory functioning, and deficits in reasoning and thought processing. Two other chronic-disease groups, emphysema and diabetes mellitus, have cognitive-intellectual needs in two categories. The needs of the emphysema group relate to deficits in memory functioning and deficits in learning functioning. The needs of the diabetes mellitus group relate to deficits in perceptual functioning and deficits in reasoning and thought processing functioning. Only one other chronic-disease group, the colon/rectum cancer group, has cognitive-intellectual needs reported, and these relate to only one category, deficits in learning functioning.

TABLE 3-12
COGNITIVE-INTELLECTUAL NEED STATEMENTS IN NEED-CONSTELLATION "CLUSTERS" BY DISABILITY

	DISABILITIES															
	MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS AFFECTED
	ST	SCI	CP	MP	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	
1. Deficits in general measured intellectual functioning			X	X	X	X					X		X	X	22	7
2. Deficits in perceptual functioning	X		X	X	X							X	X		22	7
3. Deficits in memory functioning	X		X	X	X				X		X		X	X	12	8
4. Deficits in learning functioning	X		X	X	X				X	X			X		14	7
5. Deficits in reasoning & thought processing functioning	X	X	X	X	X						X	X	X	X	30	9
															100	
Total # of Need Statements															147	

X = there are needs in this particular life function "need cluster"

Sensory Disabilities

As shown in table 3-12, cognitive-intellectual needs are fairly widespread among persons with sensory disabilities. Needs in every cognitive-intellectual category are reported for the hearing-impaired group. For the visually-impaired group, needs are reported in three of the five categories, including deficits in general measured intellectual functioning, deficits in memory functioning, and deficits in reasoning and thought processing.

Generalizations

Cognitive-intellectual problems, in general, do not affect large numbers of disability groups. The largest number of groups for which cognitive-intellectual needs in any one category are reported is nine; the smallest is seven. Nonetheless, within each category, cognitive-intellectual needs are reported for half or more of the representative disabilities.

Among all disabiliites, the highest percentage of cognitive-intellectual needs statements falls in the category of deficits in reasoning and thought processing (30 percent), followed by deficits in general measured intellectual functioning and deficits in perceptual functioning (22 percent each). Moreover, cognitive-intellectual needs are not evenly distributed among disability groups but are concentrated most heavily within the behavioral disability group, the sensory disability group, and the motor disability group.

FINDINGS RELATING TO THE SOCIAL-ATTITUDINAL FUNCTIONING AREA

The social-attitudinal life-function area includes two major categories of needs: 1) social needs and 2) individual needs. Social needs are those which arise in relation to interaction with other persons. As shown in table 3-13, these needs include problems relating to 1) withdrawal and isolation, 2) social incompetence, 3) dependency and dependency conflicts, 4) anti-social behavior and attitudes, and 5) difficulty in sexual relationships. Individual social-attitudinal needs are those which have to do with the integrity of an individual's personality. As depicted in table 3-13, these needs include 1) disturbances of self-concept, 2) common reactions to disability and treatment, and 3) pathological and personality disturbances. However, only a fine line of distinction separates social from individual social-attitudinal needs. For example, a person's self-concept, which is related to individual functioning, is often very much influenced by the reactions or perceived reactions of others to him, a social interaction.

Social-attitudinal needs, as shown in table 3-13, are almost as widespread as are health needs, and although higher concentrations of social-attitudinal needs are found within certain classifications of disabilities, a variety of social-attitudinal needs is found within all four classifications of disabilities.

Motor Disabilities

As shown in table 3-13, a high concentration of social-attitudinal needs is found among persons with motor disabilities. For the spinal-cord injury group, needs are reported in every category of social-attitudinal needs. For the stroke group, needs are reported in every category except difficulty in sexual relationships. The cerebral-palsy group, however, has needs reported in only four of the eight categories: withdrawal and isolation, social incompetence, anti-social behavior and attitudes, and disturbance of self concept.

TABLE 3-13
SOCIAL ATTITUDINAL NEED STATEMENTS IN NEED-CONSTELLATION "CLUSTERS" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS AFFECTED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	
Social	1. Withdrawal & Isolation	X	X	X	X		X	X			X	X	X	X	X	10	11
	2. Social Incompetence	X	X	X	X		X	X		X		X	X	X	X	14	11
	3. Dependency & Dependency Conflicts	X	X		X	X	X	X				X		X	X	6	9
	4. Anti-social Behavior & Attitudes	X	X	X	X	X		X			X	X	X	X		8	10
	5. Difficulty in Sexual Relationships		X		X	X	X					X			X	4	6
Individual	6. Disturbances of Self Concept	X	X	X	X	X	X	X	X	X	X	X		X	X	10	13
	7. Common Reactions to Disability & Treatment	X	X		X	X	X	X	X	X	X	X	X	X	X	34	13
	8. Pathological Personality Disturbances	X	X		X	X	X	X	X		X	X	X	X		14	11
																100	

Total # of Need Statements 316

Behavioral Disabilities

The highest concentration of social-attitudinal needs, as shown in table 3-13, is found among persons with behavioral disabiliites. Social-attitudinal needs in every category are reported for the mentally retarded, and social-attitudinal needs in every category except one are reported for both the epilepsy and schizophrenia groups. For the epilepsy group, the only category in which needs are not reported relates to withdrawal and isolation. For the schizophrenia group, the only category in which no needs are reported relates to anti-social behavior and attitudes.

Chronic Diseases

The lowest concentration of social-attitudinal needs is found within the chronic-disease classification. However, as shown in table 3-13, high concentrations are found within individual disability groups in this classification. For example, the kidney-disease group has needs in all social-attitudinal categories. The rheumatoid-arthritis group also has a wide variety of social-attitudinal needs, with needs statements in every category except social incompetence and difficulties in sexual relationships. The social-attitudinal needs of the colon/rectum cancer group and diabetes mellitus group are only slightly less extensive, with only three categories for each in which no needs are reported. Neither group has needs in the categories of dependency and dependency conflicts or difficulty in sexual relationships. Additionally, no needs are reported for the colon/rectum cancer group in the category of social incompetence, and no needs are reported for the diabetes-mellitus group in the category of disturbance of self-concept.

The chronic-disease disability groups with the least extensive social-attitudinal needs, as shown in table 3-13, are the emphysema group and the coronary-heart-disease group. The needs of these groups are concentrated in the category of individual functioning. Needs are reported for both groups in regard to disturbance of self-concept and common reactions to disability and treatment. For the coronary heart disease group, an additional category of individual needs is related to pathological and personality disturbance. For the emphysema group, the other category of need is social and relates specifically to social incompetence.

Sensory Disabilities

Table 3-13 shows that the social-attitudinal needs of persons with sensory disabilities are extensive, particularly among the hearing-impaired group. The hearing impaired have needs in every category except difficulty in sexual relationships. The social-attitudinal needs of the visually impaired, as shown in table 3-13, relate primarily to social functioning, with needs reported in every social-need category except anti-social behavior and attitudes. By contrast, the only area of individual functioning for which needs are reported for the visually impaired is in the category of common reactions to disability and treatment.

Generalizations

An examination of the percentages of statements in each category of social-attitudinal needs, as shown in table 3-13, reveals that needs statements relating to individual functioning are more numerous than are statements relating to social functioning. Of the total number of needs statements, 58 percent relate to individual functioning. Moreover, one category within the individual social-attitudinal area, common reactions to disability and treatment, accounts for 34 percent of all social-attitudinal needs statements and affects 13 of the 14 disability groups. The common reactions to disability and treatment category, however, includes large numbers of very normal and predictable reactions of individuals who are confronted for the first time with the fact of disability. When effective counseling therapy is introduced as part of treatment, such reactions are often of short duration. Effective delivery of counseling services in this area could, in other words, substantially reduce the number of social-attitudinal impairments of the disabled.

Other social-attitudinal needs may be reduced by various types of environmental change. The high concentration of social-attitudinal problems among persons with behavior disabilities, for example, may be attributable to the stigma historically associated with such disabilities. A change in the attitudes of society might substantially alter the social-attitudinal needs profile of this group. Similarly, the high concentration of social-attitudinal needs among spinal-cord-injury and stroke victims may result from the high visibility of their impairments and the state of dependency to which they are often reduced. If the environment were altered to alleviate either or both of these factors, social-attitudinal needs of these groups might be expected to change.

Overall, the widespread prevalence of social-attitudinal needs among all 14 disability groups calls attention to a too often neglected area of need in rehabilitation.

THE RELATIONSHIPS BETWEEN LIFE-FUNCTION NEEDS AND MULTIPLE DISABILITIES

One of the most important observations to be derived from the life-functions data is that many of the seemingly anomalous co-occurrences of life functions needs within particular disability groups result from the simultaneous presence of two or more disabling conditions in individual members of those groups. An analysis of the life-function need statements reveals that 12 of the 14 representative disabilities are related to at least one of the other representative disabilities. Though strengths of relationships cannot always be ascertained, certain secondary disabilities are observed to occur at above average rates with each of the 14 disability groups. Table 3-14 indicate the secondary impairments associated with various case study disabilities. The vertical columns show, for each primary disability, the secondary impairments reported in the literature. The horizontal rows show the extent to which each disability appears as a secondary impairment in other disability groups.

As shown in table 3-14, some specific disabilities--coronary heart disease, stroke, cancer of the colon/rectum, spinal cord injury, and schizophrenia--do not appear to be associated with many secondary impairments. A number of factors contribute to this phenomenon. Both stroke and coronary heart disease have acute onsets and are controllable by the cessation of risk-factor behaviors. No representative disabilities are listed as secondary impairments of coronary heart disease, and only one representative disability, visual impairment, is found as a secondary impairment among stroke victims.

Two other representative disabilities with acute onset are spinal-cord injury and cancer of the colon/rectum. In the case of colon/rectum cancer, if the carcinoma is completely removed, the remaining impairments are essentially psychological rather than physiological--for example, adjustment to apparatus, familial adjustment, and re-entry into society and the labor force. The cancer is no longer a causative disease agent, and other disabilities do not appear to develop. If the cancer is not completely removed, death is the usual result.

TABLE 3-14
INTERRELATIONSHIPS AMONG DISABILITY GROUPS

		CASE STUDY DISABILITIES													
		MR	CP	EP	HI	VI	CHD	CRC	SZ	ST	SCI	KD	RA	DM	EM
SECONDARY IMPAIRMENT	MR	-	MR	MR	MR				MR						
	CP	CP	-		CP										
	EP	EP	EP	-								EP			
	HI	HI	HI		-										
	VI	VI	VI		HI	-				VI		VI		VI	
	CHD	CHD		CHD	CHD	CHD	-					CHD	CHD	CHD	CHD
	CRC							-							
	SZ			SZ	SZ				-				SZ		
	ST									-					
	SCI										-				
	KD			KD							KD	-		KD	
	RA											RA	-		
	DM					DM						DM		-	
	EM														-

ABBREVIATIONS FOR THE FOURTEEN CASE STUDY DISABILITIES

MR=Mental Retardation
CP=Cerebral Palsy
EP=Epilepsy
HI=Hearing Impairment
VI=Visual Impairment
CHD=Coronary Heart Disease
CRC=Colon/Rectum Cancer

SZ=Schizophrenia
ST=Stroke
SCI=Spinal Cord Injury
KD=Kidney Disease
RA-Rheumatoid Arthritis
DM=Diabetes Mellitus
RM=Emphysema

A large number of physiological impairments are associated with spinal cord injuries; however, only one is one of the 14 representative disabilities--kidney disease or uremia.

Schizophrenia, a mental and behavioral disorder, is not a physiological disorder itself and is not associated with other physiological impairments. Mental retardation, which is also a mental disorder, is the only one of the 14 representative disabilities considered to be a significant secondary impairment for victims of schizophrenia.

The remaining four disabilities (kidney disease, rheumatoid arthritis, diabetes mellitus, and emphysema) exhibit a wide range of the representative disabilities as secondary impairments. Kidney disease has the largest number (five), with rheumatoid arthritis and diabetes mellitus both having three, and emphysema only one.

Although previous research has focused some attention on the extent to which persons are multiply disabled, very little has been done to ferret out the relationships of disabilities to one another. The importance of such a task, however, is enormous. In the first place, accurate estimates of the size of disabled target populations cannot be obtained if multiply handicapped persons are counted twice or, by error in the opposite direction, counted only once. What would be needed is a standardized accounting system which counts, for example, persons with kidney disease only, persons with kidney disease and coronary heart disease, persons with kidney disease, coronary heart disease, *and* visual impairment, and so on through all combinations. Such an accounting system would provide far more information about the needs of the multiply handicapped population than is presently available.

TECHNOLOGICAL CAUSES OF LIFE-FUNCTION NEEDS

In addition to life-function needs resulting from secondary impairments, a number of life-function needs within certain disability groups are attributable to adverse effects of the rehabilitation technologies applied to the disability. Three examples illustrate the problem.

For persons with end-stage renal failure, alternatives are limited: dialysis, transplant, or death. Several life-function needs, for example are attributable to dialysis. In the health life-function area, dialysis may cause the following: intense itching, susceptibility to infections, peripheral neuropathy, joint complications, bone disease, impotence, strange taste sensations, pain associated with the cannula implanted for dialysis, and sleep disturbance. In the cognitive-intellectual area, disequilibrium associated with being dialyzed too fast and too long may progress to seizures and mental confusion, and delirious reactions have been noted during or after dialysis. Mobility is affected because the patient is immobilized for a time after installation of a leg shunt; must avoid excessive movement of the cannulated limb; must keep the shunt, if it is used, completely dry and so must avoid water activities; and must limit social activities and travel in order to receive regular dialysis. Finally, dialysis affects social-attitudinal functioning, causing depression, anxiety associated with lack of confidence in the equipment, irritability, negativism, aggressiveness, body image confusion, and many other reactions, including suicide in rare cases.

For the person with cancer of the colon or rectum, the choices are again difficult: colostomy or death. Once the colostomy operation is performed, the patient faces a variety of difficulties in adjusting to the life of managing a colostomy. Although one disabled women interviewed in conjunction with the study claims that one can wear a bikini despite the stoma or waste bag, problems include the following: uncontrolled bowel movements until the patient learns to manage the colostomy, odor due to discharge of waste materials and fear of the embarrassing effects of odor, pain, impotence, loss of pleasurable sensation during intercourse; and a wide range of psychological reactions. Although some problems can be solved once the requirements of the colostomy are mastered, others cause continuing irritations or impairments.

Epilepsy is another disability in which rehabilitation technology contributes to secondary impairments. Many of the problems of the epileptic are attributable to anticonvulsant drugs: symptoms such as fatigue, nausea, skin rashes, anemia nephrosis, hyperventilation, mental confusion, diminished muscle tone, ataxia, dizziness, and so on, almost without end. A very sizeable number of the life function needs for epileptics appear to be tied to the drugs used in treatment, each of them with its own constellation of adverse side effects. Although the epileptic, like many other disabled persons, has few choices, questions must be raised about the state of rehabilitation technology when it appears to create impairments as it alleviates others.

VALIDATION OF LIFE-FUNCTIONS DATA BY DISABLED PERSONS

Interviews with disabled persons largely confirm the life-functions data gathered from other sources. (These interviews are documented in volume IV of this report.) The one major discrepancy between the two sets of information is in the area of health needs. Health needs are mentioned far less frequently in the interviews than they are in other sources. A probable explanation for this discrepancy is the medical origin of most of the literature of disability. Obviously, in medical literature, health needs receive primary emphasis.

The needs reflected in the interview information are largely centered on limitations on daily activities. Arthritic respondents, for example, are concerned with such needs as caring for their hair, opening jars and car doors, and riding escalators. Respondents among the spinal-cord injured express needs relating to opening doors, opening cans, and reaching blackboards.

In the interview information, confirmation is also given to the great importance of social-attitudinal needs among the disabled. Very frequently, respondents express concern not only with the limitations in functioning but with the potential embarrassment of displaying these limitations. Other frequently expressed social-attitudinal concerns in the interview information relate to annoyance with the reactions to disability among both strangers and significant others. Guilt or frustration because of dependence on others is also frequently expressed.

Above all, the interview information reveals the unique perspective on life-functions needs to be gained through consultation of the disabled themselves.

CONCLUSION

Life-function information illustrates not only the commonality of certain types of needs within and among certain classifications of disabilities, but also the validity of classifying disabilities according to life-function needs rather than according to other frequently used schemes such as by causative factors or type of organic involvement.

The problem with some of the existing classification schemes is illustrated by a recent Federal Developmental Disabilities Program dealing with mentally retarded, epileptic, cerebral palsied, and autistic persons. The design of this program apparently is based on the assumption that these disabilities are similar and that the needs of persons afflicted by them are similar enough to be dealt with in a single program. An analysis of the life-function needs data casts doubt on these assumptions. For example, cerebral-palsied persons are shown in the life-function data to have many mobility needs, whereas mentally retarded and epileptic persons have relatively few. For this reason, cerebral palsy is classified in this technology assessment as a motor disability.

Another major difference between the cerebral palsied and the mentally retarded and epileptic groups is evident in the communications life function, with the cerebral palsied having many more needs in this life function than do the retarded or epileptic groups. By contrast, the cerebral palsied are shown in the life-functions data to have many fewer cognitive-intellectual needs than do the mentally retarded and epileptic groups.

In addition, the epileptic and the mentally retarded groups, although similar in many ways, differ significantly in others. The epileptic group, for example, has many more health needs than does the mentally retarded group, whereas, the mentally retarded group has more communication needs than does the epileptic group.

Although such functional differences do not negate the usefulness of the concept "developmental disabilities," they do suggest the potentially greater usefulness for policy development of classifying disabilities according to life-functions needs rather than according to more traditional schemes.

CHAPTER 4
REHABILITATION TECHNOLOGIES

Effective policymaking relating to rehabilitation technologies must be based on accurate information about (1) the distribution and types of technologies currently available and (2) the extent to which the technologies correlate with the needs of disabled persons. This information facilitates judgments about the adequacy of current technologies, the need for development of new technologies, and the need for broader application of current technologies. The task of compiling this information in meaningful form is monumental, and it is severely hampered by the inability of advocacy organizations for the disabled to supply information. This and other significant impediments to the gathering of comprehensive and meaningful data are discussed in appendix B. Therefore, information on current technologies has been gathered through literature search and has been reviewed by experts. The 14 specific disability groups selected as representative of the overall problem of disability elsewhere in this report are used here to represent the types and distribution of technologies applied throughout rehabilitation.

DEFINITION OF "TECHNOLOGY"

The common-language definition of "technology" which most nearly approaches the definition used in this technology assessment is "a method, process, technique, or the like for handling a specific technical problem." However, this definition does not make the essential distinction between "technique" and "technology" necessary for meaningful enumeration and comparison of technologies. Therefore, in this technology assessment, "technology" is stipulatively defined as "a collection of techniques broadly similar in application (even though they may differ in detail) which are qualitatively different from other collections of techniques which address the same problem." Examples of such collections of techniques which are classified as distinct technologies under this definition include surgical techniques to correct orthopedic deformities, and braces which are used to correct orthopedic deformities. Both of these technologies include a number of specific techniques which differ from each other in detail; however, in one case, all techniques involve surgical repair, and in the other, all techniques involve bracing. This distinction between techniques and technologies is used so that technologies examined are considered at roughly the same level of generality or abstraction.

TYPES OF TECHNOLOGIES

Currently applied technologies fall into three general categories, according to mode of application. These categories are Environmental Change, Physical Intervention, and Training/Counseling. An examination of the percentages of technologies falling within each of these categories, both for specific disability groups and for all disabilities, is potentially useful in pointing out over-application or under-application of particular classes of technologies.

ENVIRONMENTAL CHANGE

Environmental-change technologies are those which change the environment of a disabled person and thereby effect a change in his ability to function. This category includes the broad areas of community design, design of living environments, alterations in vocational environments, and alterations in transportation systems. Changes in both the physical and social environment are included in this category. A taxonomy of environmental-change technologies is shown in figure 4-1. The most general classes of technologies within the category are shown at the far lefthand side of the diagram, and increasingly specific classes of technologies are shown to the right.

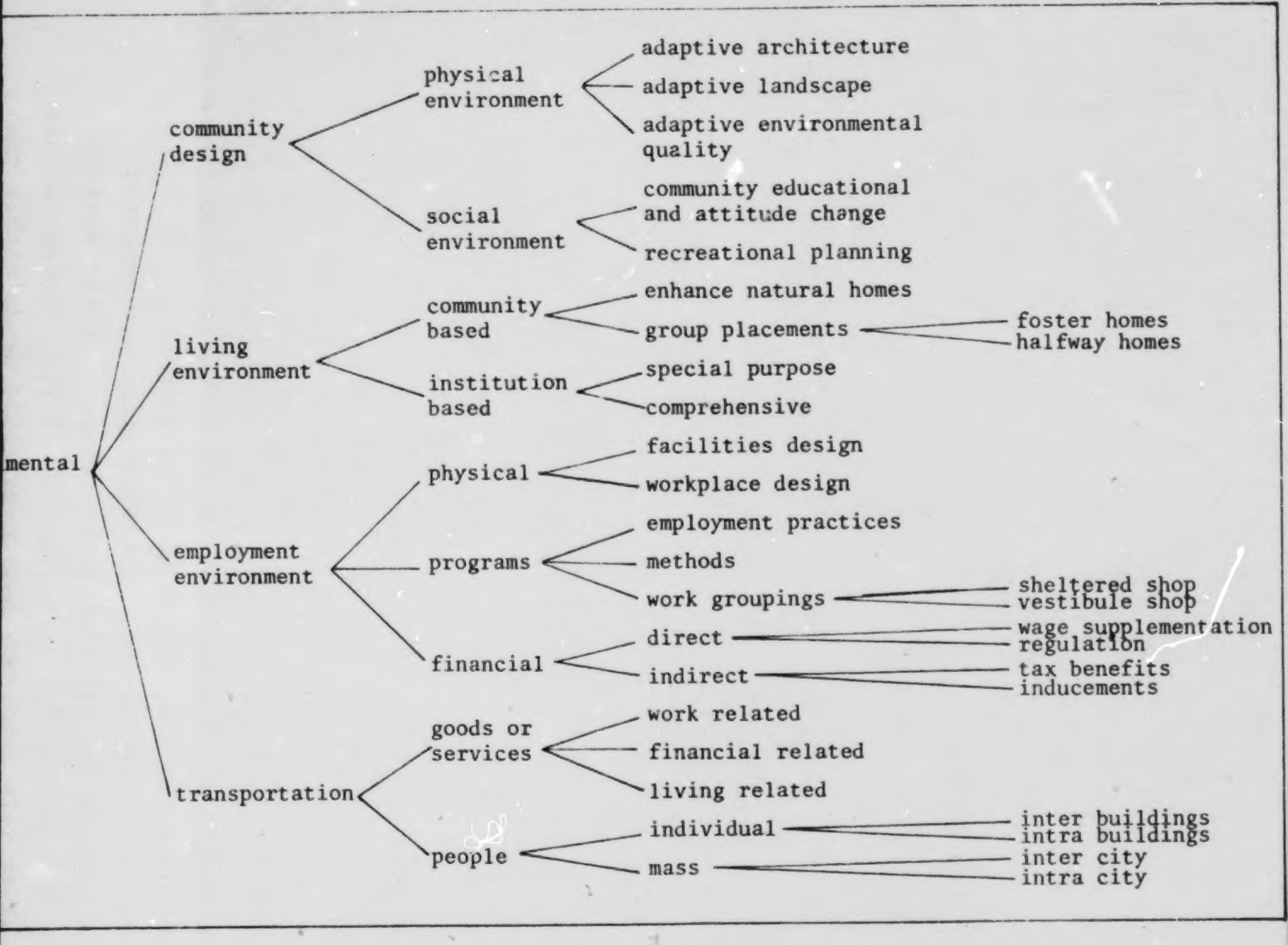

mental
community design
physical environment
adaptive architecture
adaptive landscape
adaptive environmental quality
social environment
community educational and attitude change
recreational planning
living environment
community based
enhance natural homes
group placements
foster homes
halfway homes
institution based
special purpose
comprehensive
employment environment
physical
facilities design
workplace design
programs
employment practices
methods
work groupings
sheltered shop
vestibule shop
financial
direct
wage supplementation
regulation
indirect
tax benefits
inducements
transportation
goods or services
work related
financial related
living related
people
individual
inter buildings
intra buildings
mass
inter city
intra city

Figure 4-1. Tree diagram: technology levels for environmental change

PHYSICAL INTERVENTION

Physical-intervention technologies are those which change the person through physical means, including the use of physical devices such as prosthetics, of chemical agents such as prescription medicines or diets, and of surgical techniques such as transplantation and neurosurgery. These technologies can sustain life, restore functioning, or augment functioning. A taxonomy of physical-intervention technologies is shown in figure 4-2.

TRAINING AND COUNSELING

Training and counseling technologies are those which change a person by altering his skills, concepts, or attitudes. These technologies may sustain, restore, or augment functioning. Included in this category are the whole range of academic and vocational education, corrective therapies, and psychological counseling and therapy. A taxonomy of training and counseling technologies is shown in figure 4-3.

CORRELATION BETWEEN TECHNOLOGIES AND LIFE-FUNCTION NEEDS

An evaluation of the adequacy of current technologies depends on a number of factors, one of the most important of which is the extent of correlation between technologies available and needs of disabled persons within each of the five life-functions areas. Therefore, technologies within each of the 14 specific disability groups are classified according to the life-function needs they meet as well as according to the mode of application they represent. This dual classification scheme is especially useful in determining the need for new technological development.

For some disabilities, no technologies are reported within some of the life-functions areas. Several factors may be responsible for such results. First, persons within that disability group may have negligible needs within the area, therefore, no technologies have developed in that area. Second, technologies may be available within that

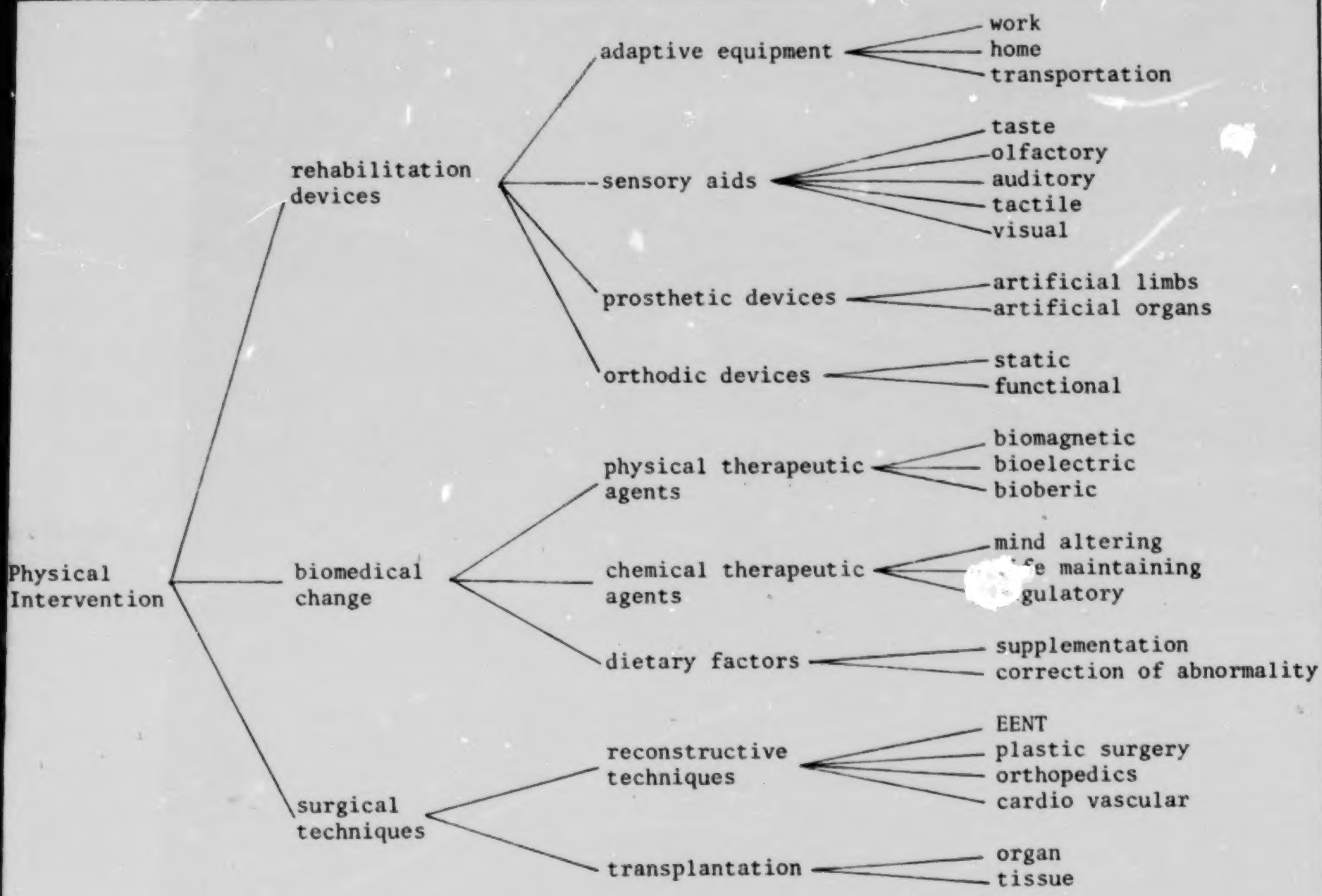

Physical Intervention
rehabilitation devices
adaptive equipment
work
home
transportation
sensory aids
taste
olfactory
auditory
tactile
visual
prosthetic devices
artificial limbs
artificial organs
orthodic devices
static
functional
biomedical change
physical therapeutic agents
biomagnetic
bioelectric
bioberic
chemical therapeutic agents
mind altering
[illegible]fe maintaining
[illegible]gulatory
dietary factors
supplementation
correction of abnormality
surgical techniques
reconstructive techniques
EENT
plastic surgery
orthopedics
cardio vascular
transplantation
organ
tissue

Figure 4-2. Tree diagram: technology levels for physical intervention

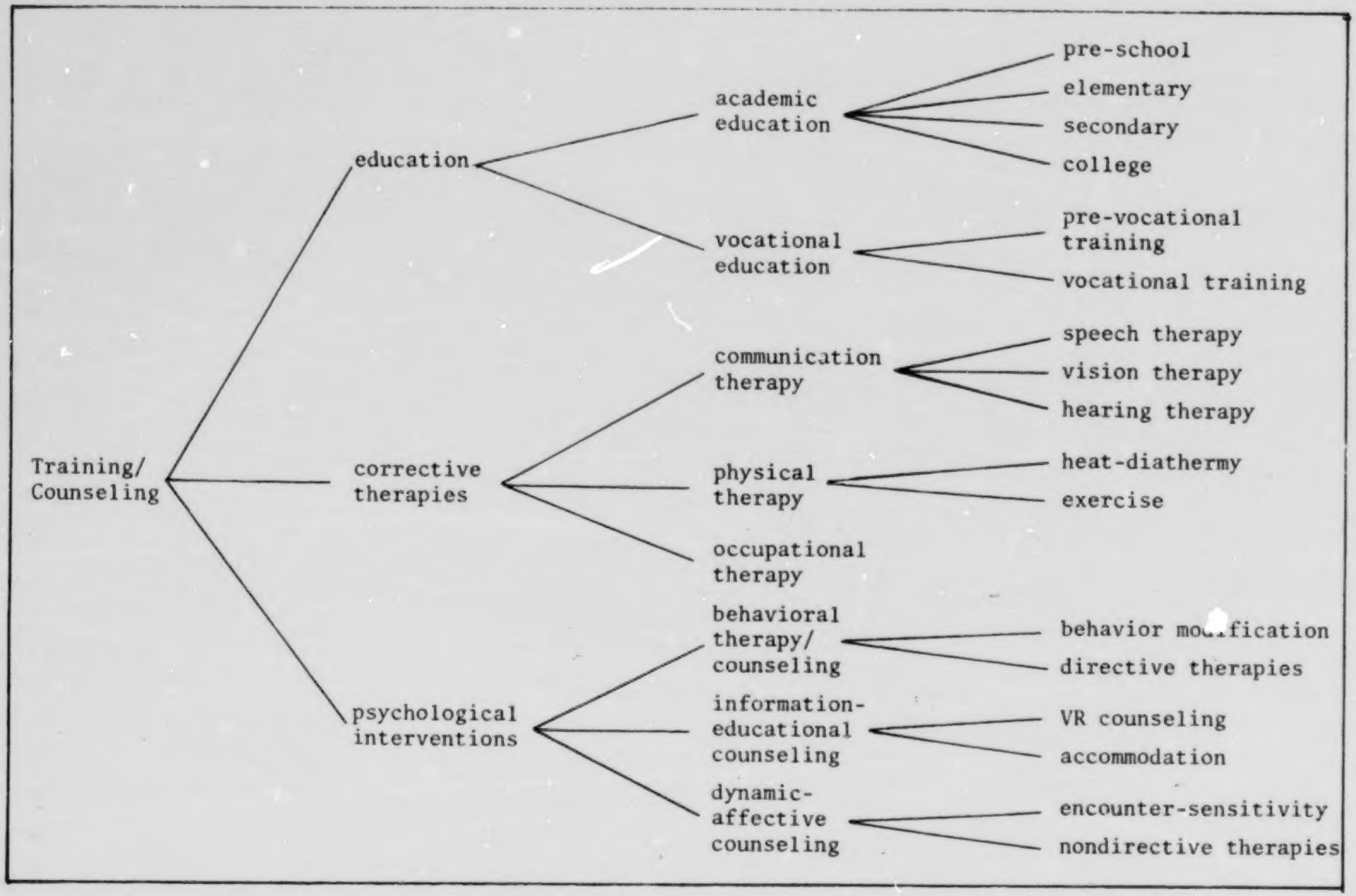

Training/ Counseling
education
academic education
pre-school
elementary
secondary
college
vocational education
pre-vocational training
vocational training
corrective therapies
communication therapy
speech therapy
vision therapy
hearing therapy
physical therapy
heat-diathermy
exercise
occupational therapy
psychological interventions
behavioral therapy/ counseling
behavior modification
directive therapies
information-educational counseling
VR counseling
accommodation
dynamic-affective counseling
encounter-sensitivity
nondirective therapies

Figure 4-3. Tree diagram: technology levels for training and counseling

life-function area but may not be adequately described in research sources. Third, persons within the disability group may have needs within a particular area, and technologies have not been developed to meet them. (The extent of needs within particular life-function areas is described in chapters 2 and 3 of this report.) The availability of technologies other than those described in available research sources is possible. However, the absence of any reported technologies within life-function areas for which needs are verified probably reflects underdevelopment of technologies in that area.

In the following pages, technologies applied to life-function needs with each disability group are listed in tables. Summary observations are given for each table. Following examination of technology application within each disability group, analytic observations about the total range of application of technology to the entire spectrum of disability are presented.

TECHNOLOGIES APPLIED TO STROKE

Among persons disabled by stroke, the life-function area in which the greatest number of needs occurs is mobility. Needs are reported in all but two of the 17 specific categories of mobility needs. Specific mobility needs result from paralysis, difficulties in fine motor control, interference with voluntary movements, tonal abnormalities, and atrophy and weakening of muscles. These needs are predictable, because stroke almost invariably leads to some degree of paralysis. All techniques for dealing with the mobility needs of persons disabled by stroke fall in the category of physical intervention. Included among these techniques are several types of orthotic devices, prosthetic devices, and adaptive equipment.

Persons disabled by stroke also have a large number of health needs. These needs are associated primarily with sensation discomforts and interference with sensation, generalized tissue disorders, brain disorders, and difficulties in ventilation. The health life function accounts for 16 percent of the total techniques for dealing with problems of persons disabled by stroke. Specific techniques include various forms of physical therapy and drug therapy to increase or maintain blood circulation.

Social-attitudinal needs of persons disabled by stroke are nearly as numerous as health needs. These needs are widely distributed among the specific categories of social-attitudinal needs, with the most prominent involving depression, loss of self-esteem, psychotic disturbances, anxiety, frustration and bitterness at the condition, and irritability and lapses in tact. The social-attitudinal life function, however, accounts for only 6 percent of the total techniques for dealing with problems associated with stroke. Specific techniques for dealing with social-attitudinal problems include psychotherapy, vocational placement, and control of spasticity through "deafferentiation." Psychotherapy and vocational placement, however, are wide-ranging technologies encompassing a variety of specialized therapies and programs.

Although the communication life function is often impaired among persons disabled by stroke, this life function accounts for a disproportionate percentage (45 percent) of the total techniques for dealing with problems associated with stroke. This apparent discrepancy is partially attributable to the plethora of techniques associated with very specific types of adaptive equipment such as eye- and tongue-controlled typewriters, telephone aids, and communication systems.

Cognitive-intellectual needs account for only a tiny percentage--8 percent--of the total needs of persons disabled by stroke. Needs in this life function relate primarily to problems in reasoning and thought processes. Techniques for dealing with these problems include special education and memory aids.

The list of technologies applied to stroke is given in table 4-1.

TABLE 4-1
LIST OF TECHNOLOGIES APPLIED TO STROKE

Life Function	Technology Techniques	Technology Category		
		PI	TC	EC
Health	Physical Therapy			
	Breathing exercises (Weiss, 1976)		X	
	Tilting of bed for adequate ventilation (Weiss, 1976)	X		
	Heat, massage, and stretching to treat deformities (Diller, 1973)	X		
	Drug Therapy			
	Hypertensive control (Cohen, 1975)	X		
	Anti-coagulants (Cohen, 1975)	X		
	Auto regulation (Cohen, 1975)	X		
	Vasodilation (Cohen, 1975)	X		
	Biomedical Electronic Devices			
	Holter monitor (Clipper, 1975)	X		
	Prosthetic Devices			
	Upper extremity control base (Ilanit,	X		
	The McKibben artificial muscle (Braided fluid actuator)(Rae, 1961)	X		
	Externally powered artificial arm (Lynam, 1970)	X		
	Orthotic Devices			
	Michigan feeder (Rae, 1961)	X		
	Hydraulically operated elbow orthesis (Heather, 1962)	X		
	Electrically powered hand splint (Potter, 1971)	X		

TABLE 4-1 (Continued)
LIST OF TECHNOLOGIES APPLIED TO STROKE

Life Function	Technology Techniques	Technology Category		
		PI	TC	EC
	Long leg brace system (Scott, 1971)	X		
	Rancho electric arm and tongue switch control (Nickel, 1968)	X		
	Adaptive Equipment			
	Stair-climbing wheelchair (Zudans, 1971)	X		
	Electric wheelchair (Nickel, 1968)	X		
	Reduce gravity simulator (Vallbova, 1970)	X		
	Physical Therapy			
	Percept-concept motor training therapy (Shaeffer, 1970)		X	
	Surgical Procedures			
	End organ surgery (Freed, 1975)	X		
	Lower and upper extremity correction (Freed, 1975)	X		
Communication	Adaptive Equipment			
	Communication terminal for the loss of speech (Vande, 1975)	X		
	Dual-purpose telephone (Vande, 1975)	X		
	ANROWD (Alpha Numeric Readout Display) (Vande, 1975)	X		
	Code operated selector (COS) (Vande, 1975)	X		
	COMHANDI (Vande, 1975)	X		
	Alphabet message scanner (Vande, 1975)	X		
	Code-Con set telephone aid (Vande, 1975)	X		
	Auto-Com (Vande, 1975)	X		
	Automatic dialing telephone (Model ADT-5A)(Vande, 1975)	X		

TABLE 4-1 (Continued)
LIST OF TECHNOLOGIES APPLIED TO STROKE

Life Function	Techniques Techniques	Technology Category		
		PI	TC	EC
	TV phone (Vande, 1975)	X		
	Tongue controlled typewriter (Vande, 1975)	X		
	MCM communication system (Vande, 1975)	X		
	View Com ™ (Vande, 1975)	X		
	VAPC communicator (Vande, 1975)	X		
	Keyboard operated wall display (Vande, 1975)	X		
	Electromechanical device (Vande, 1975)	X		
	MC 6400 communicator (Vande, 1975)	X		
	Electronic readout spelling machines (Vande, 1975)	X		
	Eye-controlled teletypewriter (Vande, 1975)	X		
	Dvorak one-hand typewriter (Vande, 1975)	X		
	Speech Therapy (Weiss, 1976)		X	
	Use of wives as speech therapists (Diller, 1973)		X	
Social/ Attitudinal	Psychotherapy (Weiss, 1976)		X	
	Control of spasticity through "deafferentiation" (Weiss, 1976)	X		
	Vocational Placement Programs (Diller, 1973)		X	
Cognitive/ Intellectual	Special Education (Weiss, 1976)		X	
	Memory Aids (Weiss, 1976)		X	

TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Among persons disabled by spinal cord injury, major needs are fairly equally divided among the health, mobility, and social-attitudinal life functions. Specific health needs are very diverse. Mobility needs primarily involve obvious problems associated with paralysis and interference with physical locomotion. Social-attitudinal needs are also very diverse, including many problems associated with isolation and withdrawal, dependency, frustration, and difficulties in sexual relations. No distinctive communication or cognitive-intellectual needs are reported for persons disabled by spinal cord injury.

The distribution of technologies for dealing with the life-function needs of persons disabled by spinal cord injury is similar to the distribution of needs among these persons, except that few technologies for dealing with social-attitudinal needs are reported in research sources, whereas, several communication technologies are reported. Technologies for dealing with health needs include drug therapy, surgical procedures, physical therapy, orthopedic devices, and catheterization techniques. The major technologies for dealing with mobility needs include orthotic and prosthetic devices and adaptive equipment such as wheelchairs and hand controls for automobiles. Technologies for dealing with social-attitudinal needs include occupational therapy, counseling, and psychotherapy. Although the total number of technologies for dealing with social-attitudinal needs is small, these are broad technologies encompassing a variety of specialized techniques. The disproportionately high percentage of communication technologies is due primarily to the inclusion within this category of numerous very specialized types of adaptive equipment, which are used to offset the disabling effects of paralysis and which are also included in the mobility category.

The list of technologies applied to spinal cord injury is given in table 4-2.

TABLE 4-2
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Drug Therapy			
	Drug treatment of pressure sores	X		
	Drug treatment of spasms (Glass, 1975)	X		
	Urinary antiseptics (Felton, Perkins, and Levin)	X		
	Surgical Procedure			
	Surgical treatment of pressure sores	X		
	Muscle rebalancing (J. Bone and Joint Surgery)	X		
	Surgical lengthening of muscles	X		
	Surgery in the bladder	X		
	Neurotomy (division of nerves)	X		
	Physical Therapy			
	Calipers to stretch muscles and tendons	X		
	Exercise to prevent stone formation	X		
	Education			
	Teaching bowel and bladder control techniques (Felton, Perkins and Levin)		X	
	Antipyretic Measures (To control fever outbreaks which result from impaired body temperature control)(Felton, Perkins, and Levin)	X		
	Dietary Management			
	Regimens of high water ingestion to reduce formation of kidney stones (Felton, Perkins, and Levine)	X		

TABLE 4-2 (Continued)
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Diet high in protein content (Felton, Perkins, and Levine)	X		
	Orthopedic Devices			
	Stryker frame (Hardy and Elson, 1976)	X		
	Stroke mandeville egerton bed (Hardy and Elson, 1976)	X		
	Kean Roto rest bed (Hardy and Elson, 1976)	X		
	Lodge Moor frame (Hardy & Elson, 1976)	X		
	"Monkey Pole" (Hardy & Elson, 1976)	X		
	Catheterization			
	Indwelling catheter	X		
	Ileal loop	X		
	External catheters (Male)	X		
Mobility	Orthotic Devices			
	CO_2 powered arm orthesis (Engen, 1969)	X		
	Reciprocal wrist extension finger flexion orthesis (Goldfinger & Goodgold, 1975)	X		
	Exoskeletal devices to limit or assist motion of any segment of the body (Goldfinger & Goodgold, 1975)	X		
	Thigh-knee-ankle orthesis (Lehnesis, 1972)	X		
	Short leg braces (Goldfinger & Goodgold, 1975)	X		
	Electric multi-axis device to drive arm (Long, 1971)	X		
	Ankle-foot orthesis (CPRD, 1972c)	X		
	Hydraulically operated elbow orthesis (Heather, 1962)	X		

TABLE 4-2 (Continued)
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Michigan feeder (Rae, 1961)	X		
	Electrically powered hand spling (Potter, 1971)	X		
	Long leg brace system (Scott, 1971)	X		
	Rancho Electro arm and tongue switch control (Nickel, 1968)	X		
	Prosthetic Devices			
	Upper extremity control base (Ilanit)	X		
	The McKibben artificial muscle (Braided fluid actuator)(Rae, 1961)	X		
	Externally powered artificial arm (Lynam, 1970)	X		
	Adaptive Equipment			
	Electric wheelchair (Nickel, 1968)	X		
	Stair climbing wheelchair (Zudans, 1971)	X		
	Reduced gravity simulator (Vallbona, 1970)	X		
	Hand controls for automobiles (Goldfinger and Goodgold, 1975)	X		
	Surgical Technique			
	Peripheral Nerve Grafting	X		
	Physical Therapy			
	Percept-Concept-Motor training therapy		X	
Communication	Adaptive Equipment			
	Communication terminal for the loss of speech (Vande, 1975)	X		
	Dual purpose telephone (Vande, 1975)	X		

TABLE 4-2 (Continued)
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	ANROWD (Alpha Numeric Readout Display) (Vande, 1975)	X		
	Code operated selector (COS)(Vande, 1975)	X		
	COMHANDI (Vande, 1975)	X		
	Alphabet message scanner (Vande, 1975)	X		
	Code-com set telephone aid (Vande, 1975)	X		
	Auto-com (Vande, 1975)	X		
	Automatic dialing telephone (Vande, 1975)	X		
	TV phone (Vande, 1975)	X		
	Tongue controlled typewriter (Vande, 1975)	X		
	MCM communication system (Vande, 1975)	X		
	View com™ (Vande, 1975)	X		
	VAPC communicator (Vande, 1975)	X		
	Keyboard operated wall display (Vande, 1975)	X		
	Electromechanical device (Vande, 1975)	X		
	Eye-controlled teletypewriter (Vande, 1975)	X		
	Dvorak one hand typewriter (Vande, 1975)	X		
Social/ Attitudinal	Occupational Therapy (Hardy and Elson, 1976)		X	
	Counseling and Psychotherapy (Hardy and Elson, 1976)		X	
Cognitive/ Intellectual	None			

TECHNOLOGIES APPLIED TO CEREBRAL PALSY

Among persons disabled by cerebral palsy, the life-function areas in which most needs are concentrated are mobility (44 percent) and communication (30 percent). Mobility needs of persons disabled by cerebral palsy primarily involve interference with voluntary movements, excessive involuntary movements, postural abnormalities, and gait problems. Communication needs of persons disabled by cerebral palsy primarily involve eye muscle abnormalities, articulation and other speech abnormalities, vocalization disturbances due to muscle dysfunction or paralysis, and blindness and refractory-related errors.

Technologies for dealing with life-function needs of persons disabled by cerebral palsy are likewise concentrated in the areas of mobility and communication. Techniques for dealing with mobility problems account for 60 percent of the total techniques for dealing with needs of persons with cerebral palsy, and techniques for dealing with communication needs account for 27 percent of the total. Specific techniques for dealing with mobility problems include neuro-surgical procedures, drug therapy, orthotic devices such as braces and splints, and sensory-motor training. Specific techniques for dealing with communication problems include various speech therapies and communication aids or devices.

Health needs of persons disabled by cerebral palsy account for only a small percentage of the total needs expressed. Specifically, these needs involve sensation discomforts and interference with sensation, and fatigue and sleep disturbances. However, research sources reveal no technologies for dealing with these needs.

Although mental retardation is present in over 50 percent of the cerebral palsied population, identified technologies for dealing with cognitive-intellectual needs are few. These needs specifically involve sensory receptivity difficulties, stimulus processing difficulties, thinking and reasoning difficulties, depressed performance on IQ tests, and pathological though processes. Only one technology for dealing with these problems is revealed in research sources. However, this technology, education, is very wide-ranging and includes a variety of specialized techniques.

Social-attitudinal needs of persons disabled by cerebral palsy include feelings of social isolation, withdrawal and fear of relationships, and depression. The technology for dealing with these problems is psychotherapy.

A list of the technologies applied to cerebral palsy is given in table 4-3.

TABLE 4-3
LIST OF TECHNOLOGIES APPLIED TO CEREBRAL PALSY

Life Function	Technology Techniques	Technology Category		
		PI	TC	EC
Health	None			
Mobility	Orthotic Devices			
	Splints & braces (McCarrol, 1972; Wilson, 1973)	X		
	Surgical Procedures			
	Brain surgery to relieve symptoms (Denoff, 1972)	X		
	Therapeutic brain lesions (electric stimulation)(Wilson, 1972)	X		
	Surgery to prevent deformity (Wilson, 1973; McCarrol, 1972)	X		
	Physical Therapy			
	Special exercise equipment and programs (Phelps, 1963)	X	X	
	Education			
	"Sensory Story" Technique (Increase use and awareness of limbs) (Barret and Jones, 1967)		X	
	Sensory-motor learning techniques (Bobarth & Bobarth, 1967)		X	

TABLE 4-3 (Continued)
LIST OF TECHNOLOGIES APPLIED TO CEREBRAL PALSY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Learning of body postures to improval functional abilities (Bobarth & Bobarth, 1952)		X	
	Drug Therapy			
	Use of drugs in treatment (Denoff, 1972)	X		
Communication	Speech Therapy			
	Language boards; picture boards; work & phase boards (McDonald & Schulz, 1973)		X	
	Multiple sense modality approach (Kirk, 1972)		X	
	Early treatment for speech defects (Hull and Hall, 1972)		X	
	Communication Devices			
	Non-verbal electronically mediated communication (Larson, 1971; Jones, 1961)	X		
Social/ Attitudinal	Psychotherapy			
	Psychiatric practices with the cerebral palsied (Allen and Jefferson, 1962)		X	
Cognitive/ Intellectual	Education			
	Cerebral palsy unit (Mullafereze, 1970)		X	

TECHNOLOGIES APPLIED TO EPILEPSY

Among persons disabled by epilepsy, life-function needs are concentrated in the areas of health, social-attitudinal functioning, and cognitive-intellectual functioning (25 to 31 percent each), with a low percentage of needs in the mobility and communication areas. Specific health needs are widely distributed among 16 different need areas, with emphasis on sleep disturbances, skin disorders, and blood disorders. Social-attitudinal needs are broad and comprehensive. Cognitive-intellectual needs relate primarily to decreased performance on standard IQ tests, deficits in reasoning and thought processes, decreased academic performance, and learning difficulties.

Technologies available for meeting the health, social-attitudinal, and cognitive-intellectual needs of persons disabled by epilepsy do not seem to correlate well with needs in these areas. The health life-function contains the largest number of technologies, but these technologies are, for the most part, aimed directly at controlling seizures rather than at alleviating the wide array of complications frequently associated with them. Only one available technology described in research sources deals with numerous social-attitudinal needs. However, presumably despite the lack of specific references to the use of psychotherapeutic techniques among epileptics, these techniques are used for persons in this group. No technologies dealing with cognitive-intellectual needs of epileptics are described in research sources. This lack, coupled with the pervasiveness of needs in this area, perhaps represents a real need for new technologies for dealing with these problems.

Mobility needs associated with epilepsy include specific physical locomotion difficulties such as paralysis, weakening of muscles, and balance problems. Technologies for dealing with these problems include primarily techniques for directly eliminating seizures and thus increasing the mobility of the disabled person.

The list of technologies applied to epilepsy is given in table 4-4.

TABLE 4-4
LIST OF TECHNOLOGIES APPLIED TO EPILEPSY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Drug Therapy			
	Anticonvulsants (Phenobarbitol, Diphenylgydantoin, Valium, etc.) (Solomon and Plum, 1976)	X		
	Surgical Procedures			
	Removal of epileptic focus (Solomon and Plum, 1976)	X		
	Hemispherectomy (Solomon and Plum, 1976)	X		
	Collosal commissurotomy (Solomon and Plum, 1976)	X		
	Stereotactic ablation (Selected diencephalic areas)(Solomon and Plum, 1976)	X		
	Cerebellum stimulation (Solomon and Plum, 1976)	X		
Mobility	Surgical Procedures			
	Stereotaxic surgery (Adams, 1968)	X		
	Biomedical Electronic Devices			
	Automatic electrical device (Small subject mounted telemetry package) (Vigilione, 1971)	X		
Communication	None			
Social/ Attitudinal	Psychotherapy			
	"First-Aid" psychotherapy (Lennox, 1960)		X	
Cognitive Intellectual	None			

TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Among persons disabled by mental retardation, the most important life-function needs are in the areas of cognitive-intellectual functioning, social-attitudinal functioning, and communication. Cognitive-intellectual and social-attitudinal needs are predictable according to the definition of mental retardation as a deficit in intellectual functioning and adaptive behavior. Communication needs are also predictable because of the close correlation between communication skills and intellectual functioning. Techniques for dealing with the needs associated with mental retardation are most numerous in the cognitive-intellectual category. These techniques generally involve education and training. Techniques for dealing with social-attitudinal needs make up the second most numerous group of techniques (27 percent), followed closely by techniques for dealing with communication needs (24 percent). Specific techniques for dealing with social-attitudinal needs consist primarily of academic and vocational education. Techniques for dealing with communication needs consist primarily of language- and reading-skills programs.

Health and mobility needs of persons disabled by mental retardation account for only a small percentage of the total needs of this group. However, technologies for meeting health and mobility needs of mentally retarded persons make up a disproportionately small percentage of the total technologies. Health needs of mentally retarded persons are primarily associated with physical deformity, brain disorders, and threats to normal system functioning. However, only 4 percent of the total techniques for dealing with mental retardation fall in the health category. Similarly, although mentally retarded persons have a wide variety of mobility needs, primarily associated with kinesthetic motor reactions, fine motor control, and inability or limited ability to walk, only 2 percent of the total techniques for dealing with mental retardation are in the mobility category.

Overall, techniques for dealing with the problems associated with mental retardation are almost exclusively training and counseling techniques, in contrast to techniques for dealing with other disabilities, which involve more physical intervention or environmental change.

The list of technologies applied to mental retardation is given in table 4-5.

TABLE 4-5
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Physical Fitness Training (Milligan, 1976)		X	
	Training for Medical Emergencies (Wilkie, 1975)		X	
Mobility	Removal of Architectural Barriers			
	Sheltered workshops (an architectural guide) (Salmon, 1966)			X
Communication	Language Skill Training			
	Language training program (Ziebert, 1971)		X	
	Language training program (Odon and Pouios, 1971)		X	
	Direction following program (Brown, *et al.*, 1973)		X	
	Location concept program (Brown, *et al.*, 1973)		X	
	Receptive language program (Brown, *et al.*, 1973)		X	
	Expressive language program (Brown, *et al.*, 1973)		X	

TABLE 4-5 (Continued)

LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Social/ Attitudinal	Reading Skills Training			
	Initial sight work reading program (Brown, et al., 1973)		X	
	Color program (Brown, et al., 1973)		X	
	Basic alphabet skill program (Brown, et al., 1973)		X	
	Chart story program (Brown, et al., 1973)		X	
	Pre-writing program (Brown, et al., 1973)		X	
	Shape, discrimination & labeling program (Brown, et al., 1973)		X	
	Education			
	Automated instruction (Platt, 1966)		X	
	Special education (Baske, 1970)		X	
	Vocationally oriented four year secondary school (Goodman, 1972)		X	
	Vocational Training			
	Industrial training resources program (Bakonovich, 1971)		X	
	Sheltered workshops (Salmon, 1966)		X	X
	Vocationally oriented four year secondary school (Goodman, 1972)		X	
	Sheltered workshops (Mezof, 1969)		X	
	Coordinated program of vocational rehabilitation & special education (Baske, 1970)		X	
	Task analysis techniques (Gold, 1972; Martin and Flexer, 1975)		X	X

TABLE 4-5 (Continued)
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Cognitive/ Intellectual	Independent living rehabilitation program (Bourgue, 1965)		X	
	Social perceptual training (Leach and Edmonson, 1967)		X	
	Money management training program (Flexer, 1976)		X	
	Language Training			
	Language training program (Odon and Povious, 1971)		X	
	Language training (Ziebert, 1971)		X	
	Education			
	Coordinated program of vocational rehabilitation and special education for the mentally retarded (Baske, 1970)		X	
	Non-verbal symbolic picture logic (Milgram, 1971)		X	
	Educational rhythmics (Arge, 1966)		X	
	Automated instruction (Platt, 1966)		X	
	Number discrimination and labeling program (Brown, et al., 1973)		X	
	Basic counting and quantity concept program (Brown, et al., 1973)		X	
	Rudimentary math concepts program (Brown, et al., 1973)		X	
	Vocational Training (Wilson, 1968)		X	
	Vocational training center (Wilson, 1968)		X	
	Automated instructions (Platt, 1966)		X	
	Multidimensional vocation rehabilitation program (Baxt, 1971)		X	

TABLE 4-5 (Continued)
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Skill analysis techniques (Viscardi, 1976)		X	
	Social Skills Training			
	Independent living rehabilitation program (Katz, 1966)		X	

TECHNOLOGIES APPLIED TO SCHIZOPHRENIA

Among persons disabled by schizophrenia, life-function needs are concentrated in the areas of communication, social-attitudinal functioning, and cognitive-intellectual functioning and are relatively evenly distributed among these three areas. Difficulties in communication primarily involve classical psychotic symptoms of distorted perception, including hallucinations and bizarre speech patterns. Social-attitudinal problems related to schizophrenia primarily involve withdrawal, dependency, and immaturity in social relationships, and difficulties stem mainly from bizarre thought processes and attentional lapses caused by distractions and hallucinations.

Technologies for dealing with needs arising from schizophrenia are most numerous within the social-attitudinal and cognitive-intellectual areas. Most of the technologies available for dealing with social-attitudinal and cognitive-intellectual needs of schizophrenics involve drug therapy along with various psychotherapies and milieu therapies such as halfway houses. Older treatments which are still in use include psychosurgery, insulin shock therapy, and electroconvulsive shock therapy. Vocational preparation and training also appear as technologies aimed at minimizing social-attitudinal and cognitive-intellectual problems.

Currently, only one technology, anti-psychotic drug therapy, is available for dealing with thought and speech disturbances which create communication needs.

The list of technologies applied to schizophrenia is given in table 4-6.

TABLE 4-6
LIST OF TECHNOLOGIES APPLIED TO SCHIZOPHRENIA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Monitoring			
	Halfway house services (See Social Attitudinal Life Function)		X	X
	Hospitalization (Solomon, 1965)	X	X	X
	Daycare center (Livingstone, 1964)(See Social Attitudinal Life Function)		X	X
Mobility	None			
Communication	Drug Therapy			
	(See Cognitive/Intellectual and Social Attitudinal Life Functions)			
	Insulin therapy (Solomon, 1965)	X		
	Major tranquilizers (Solomon, 1965)	X		
	Megavitamin therapy (Solomon, 1965)	X		
Social/ Attitudinal	Physical Therapy			
	Stretch relaxation exercises (Boruchov, 1965)		X	
	Therapeutic pool program (Milbank, 1965)		X	
	Psychosurgery			
	Lobotomization (Solomon, 1965)	X		

TABLE 4-6 (Continued)
LIST OF TECHNOLOGIES APPLIED TO SCHIZOPHRENIA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Electrophysical Therapy			
	Electroconvulsive shock therapy	X		
	Psychotherapies			
	Multiple family therapy (Lacquicui, 1971)		X	
	Individual psychotherapy (Solomon, 1965)		X	
	Community mental health center (Schlessinger, 1968)		X	
	Behavior therapy (Solomon, 1965)		X	
	Drug Therapy (See Cognitive-Intellectual and Communication Life Functions)	X		
	Insulin therapy (Solomon, 1965)	X		
	Major tranquilizers (Solomon, 1965)	X		
	Megavitamin therapy (Solomon, 1965)	X		
	Social Environment Therapy			
	Social therapuetic club (Grobb, 1965)		X	
	Halfway house services (See Health Life Function)		X	
	Daycare center (Livingstone, 1964)(See Health Life Function)		X	X
	Vocational Training and Counseling			
	Vocational group therapy (Newman, 1963)		X	
	Vocational adjustment center (Oseas)		X	
	Evaluation and adjustment center for the emotionally disturbed (Danie, 1966)		X	
	Occupational adjustment center (Milano, 1963)		X	

TABLE 4-6 (Continued)
LIST OF TECHNOLOGIES APPLIED TO SCHIZOPHRENIA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Cognitive/ Intellectual	Vocational Preparation			
	Work conditioning program (Rice, 1966)		X	
	Home economics training (Katerynuik, 1962)		X	
	Educational rhythmics (Arje, 1966)		X	
	Vocational clinic for the emotionally disturbed (Osterhok, 1967)		X	
	Drug Therapy (See Social Attitudinal and Communication Life Functions)			
	Insulin therapy (Solomon, 1965)	X		
	Major tranquilizers (Solomon, 1965)	X		
	Megavitamin therapy (Solomon, 1965)	X		

TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Among persons disabled by rheumatoid arthritis, life-function needs are most numerous (47 percent) in the area of health. Specific health needs are very diverse, with the most frequently mentioned involving sensation discomforts and interference with sensation, skin disorders, generalized tissue disorders, and threats to normal system functioning. The health life-function, however, accounts for a disproportionately small percentage (25 percent) of techniques for meeting the needs of persons disabled by rheumatoid arthritis. The most numerous techniques for meeting health needs involve physical therapy or drug therapy, but radiotherapy, surgery, and orthotic devices are also used.

The social-attitudinal life function accounts for the second highest percentage (25 percent) of needs among persons disabled by rheumatoid arthritis. Specific social-attitudinal needs involve frustration and anger at the disability, aggressiveness and hostility, and dependency conflicts. The only technology for dealing with these needs, however, is self-care devices which reduce feelings of dependency. Although several different types of self-care devices are included in this single technology, it appears that this technology is not adequate for meeting all of the social-attitudinal needs of persons disabled by rheumatoid arthritis.

The mobility life function accounts for only slightly fewer (24 percent) of the total needs of persons disabled by rheumatoid arthritis than does the social-attitudinal life function. Specific mobility needs of persons in this group involve joint problems, limitations of activities in the home, and difficulties in fine motor control. However, a disproportionately high percentage of techniques for meeting needs associated with rheumatoid arthritis are in the mobility life function. This discrepancy is largely due to the specificity of many of these techniques. Specific techniques include many different types of orthotic and prosthetic devices such as braces, artificial joints and limbs, drug therapy, and physical therapy.

Although communication needs account for only a very small percentage (4 percent) of the total needs of persons disabled by rheumatoid arthritis, no specific technologies are available for meeting these needs. Ocular diseases account for most of these communication problems.

No needs or technologies in the cognitive-intellectual areas are reported for persons disabled by rheumatoid arthritis, presumably because this disease does not impair cognitive-intellectual functioning.

The list of technologies applied to rheumatoid arthritis is given in table 4-7.

TABLE 4-7
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Physical Therapy			
	Paraffin applications (Moskowitz, 1975 (See Mobility Life Function)	X		
	Hydrotherapy (Moskowitz, 1975)(See Mobility Life Function)	X		
	Hubbard tank therapy (Moskowitz, 1975) (See Mobility Life Function)	X		
	Surgical Procedures			
	Prophalactic synovectomy (juvenile) (Journal of American Medical Association, 1970)	X		
	Osteotomy (Corentry, et al., 1975)	X		
	Synovectomy (Clayton, et al., 1973)	X		
	Arthroplamis - Total joint replacements (Journal of Bone & Joint Surgery, 1971)	X		
	Muscle rebuilding	X		
	Occupational Therapy			
	Tomis projection	X		
	Adaptive equipment	X		
	Environmental changes	X		
	Orthotic Devices			
	Splints (Moskowitz, 1975)(See Mobility Life Function)	X		
	Drug Therapy			
	Cortocosteroid preparations (Moskowitz, 1975)(See Mobility Life Function)	X		
	Immunosuppressive drugs (Moskowitz, 1975)(See Mobility Life Function)	X		

TABLE 4-7 (Continued)
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Mobility	Chrysotherapy (Gold salts)(Moskowitz, 1975)(See Health Life Function)	X		
	Nonsteroidal anti-inflammatory agent (Smyth, 1975)	X		
	Radio Therapy			
	Radioactive agents (Moskowitz, 1975) (See Mobility Life Function)	X		
	Orthotic Devices			
	Cast brace (Mooney, 1970)	X		
	Dynamic ulna-deviation splint (Rae, 1967)	X		
	Short leg brace (Inman, 1965)	X		
	Splints (Moskowitz, 1975)(See Health Life Function)	X		
	Foot appliances (Moskowitz, 1975)	X		
	Cervical collars (Moskowitz, 1975)	X		
	Back supports (Moskowitz, 1975)	X		
	Steel cable knee joint (Bechtol, 1967)	X		
	Sacro-iliac support (Bechtol, 1967)	X		
	Prosthetic Devices			
	Endoskeletal artificial arm (Bechtol, 1968)	X		
	Metallic prosthetic joint (Flah, 1966)	X		
	Multiple-axis myoelectrically controlled prosthetic arm (Wirta, 1970)	X		
	Cybernetics approach (Feedback System for prosthetic devices)(Smith, 1971)	X		
	Solid ankle cushioned heel feet (Sach)	X		
	Patellar tendon bearing below knee socket	X		

TABLE 4-7 (Continued)
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Physical Therapy			
	Paraffin applications (Moskowitz, 1975) (See Health Life Function)	X		
	Hydrotherapy (Moskowitz, 1975)(See Health Life Function)	X		
	Hubbard tank therapy (Mozkowitz, 1975) (See Health Life Function)	X		
	Drug Therapy			
	Corticosteroid preparations (Moskowitz, 1975)(See Health Life Function)	X		
	Immunosuppressive drugs (Moskowitz, 1975) (See Health Life Function)	X		
	Chrysotherapy (Gold salts)(Moskowitz, 1975)(See Health Life Function)	X		
	ACTH (Adrenal corticophin)(Moskowitz, 1975)(See Health Life Function)	X		
	Radio Therapy			
	Radioactive agents (Moskowitz, 1975) (See Health Life Function)	X		
	Adaptive Equipment			
	Wheelchair life (Elevator)(Yuker, 1966)			X
	Stair climbing wheelchairs (Zudans, 1971)	X		X
	Self-care devices (Moskowitz, 1975)(See Social/Attitudinal Life Function)	X		X
Communication	None			
Social/ Attitudinal	Adaptive Equipment			
	Self-care devices (Moskowitz, 1975)	X		X

TABLE 4-7 (Continued)
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Cognitive/ Intellectual	None			

TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE

Among persons disabled by coronary heart disease, half of the needs are in the social-attitudinal area. Prominent among social-attitudinal needs are ways of dealing with the frustration, confusion, and anger at the condition or, conversely, denial and minimization of the disability. The main technologies for dealing with social-attitudinal needs are psychological and vocational counseling.

The life-function area containing the second highest number of needs is health, with one third of the total. Specific needs within this life function involve cardiovascular impairment and restriction of sexual activity. Technologies aimed at ameliorating these problems are disproportionately numerous, representing 80 percent of the total number of technologies applied to coronary heart disease. Foremost among the technologies for dealing with health problems are various types of surgical procedures, educational and supportive services, drug therapy, exercise programs, and dietary control.

The only other life-function in which needs are reported is mobility. Specific mobility problems relate to limitations in physical exertion and difficulties in driving a car. The technologies for dealing with mobility problems represent 8 percent of the total and consist exclusively of physical therapies such as reconditioning and exercise programs.

The list of technologies applied to coronary heart disease is given in table 4-8.

TABLE 4-8
LIST OF TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Surgical Procedures (Transplantation)			
	Cardiac transplantation	X		
	Surgical Procedures (Reconstruction)			
	Myocardial revascularization (Russek and Zohman, 1971)	X		
	Endaterotomy (Patch-graft reconstruction)	X		
	Surgical Procedures (Prosthetic Devices)			
	The artificial heart (De Bakey, Liotta, and Hall, 1966)	X		
	Intra-aortic balloon counter pulsation (IABC)	X		
	Surgical Procedures (Bioelectric Devices)			
	Pace maker implant (Baker, 1966)	X		
	Synchronized direct current electric shock (Rubin, et al., 1972)	X		
	Educational and Supportive Services			
	Coronary Care Family Conference		X	
	CHD Teaching Evaluation Form		X	
	Homemaker services (Jefferson, 1966)		X	
	Family counseling for families of stroke patients (Overs, 1971)		X	
	Drug Therapy			
	Cholesterol lowering agents (Russek and Zohman, 1971)	X		
	Anticoagulants (Russek & Zohman, 1971)	X		
	Psychopharmacologic agents (Russek and Zohman, 1971)	X		

TABLE 4-8 (Continued)
LIST OF TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE

Life Function	Technology Technique	Technology Category PI	TC	EC
	Nitroglycerin (Russek & Zohman, 1971)	X		
	Exercise			
	Montefiore - YMCA exercise program for the postcoronary patient (Russek & Zohman, 1971)(See Mobility & Health Life Function)		X	
	Environmental Change			
	Heart Kitchen			X
	Monitoring			
	Coronary care unit (Yu & Kramer, 1966)	X		
	Dietary Factors			
	Planning fat control meals (Walkertin, 1966)		X	
Mobility	Physical Therapy			
	Reconditioning programs (Naughton, 1973)		X	
	Montefiore - YMCA exercise program for the postcoronary patient (Russek & Zohman, 1971)		X	
Communication	None			
Social/ Attitudinal	Psychological Counseling			
	Crisis intervention family counseling (Overs and Healy, 1971)		X	
	Vocational Counseling			
	Prevocational evluation and job training (Naughton, 1973)		X	
Cognitive/ Intellectual	None			

TECHNOLOGIES APPLIED TO EMPHYSEMA

Among persons disabled by emphysema, life-function needs are heavily concentrated in the area of health, as are techniques which deal with this disability. The major problem for persons with this disability is taking enough oxygen into the system to maintain life. Once this major problem is controlled, the other life functions are relatively unaffected. Technologies for meeting the health needs of persons with emphysema are respiratory aids and oxygen supplementation devices.

The social-attitudinal life function contains the second highest number of needs for emphysema patients. These needs involve primarily loss of self-esteem, depression, and despair. Techniques for meeting social-attitudinal needs of persons with emphysema involve educating patients about and teaching them how to cope with the disease.

Although few needs relating to mobility are expressed among persons with emphysema, 25 percent of the techniques for dealing with this disability are concentrated in this life-function. However, these techniques are also included in the health area. The duplication occurs because training and use of devices to provide more oxygen to meet health needs also increase the mobility of persons disabled by emphysema.

No techniques for meeting communication and cognitive-intellectual needs are described in research sources.

The list of technologies applied to emphysema is given in table 4-9.

TABLE 4-9
LIST OF TECHNOLOGIES APPLIED TO EMPHYSEMA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Exercise Therapy			
	Postural drainage exercises (Belinkiff, 1971)		X	
	Breathing exercises (Belinkiff, 1971; Westreich, 1970)		X	
	Oxygen Supplementation			
	Oxygen cane (Barach, 1970)(See Mobility Life Function)	X		
	Portable oxygen cylinders (Barach, 1970)	X		
	Oxy-hale or oxy-master (Barach, 1970)	X		
	Respiratory Aids			
	Maxi-myst (Petty, 1970)(See Mobility Life Function)	X		
	Hand-E-Vent (Petty, 1970)(See Mobility Life Function)	X		
	Barach-Gordon emphysema belt (Barach, 1970)	X		
	Elastic gridle (Barach, 1970)	X		
	Velcro belt (Barach, 1970)	X		
	Expectorants and bronchial detergents (Haas, 1967)	X		
	Chest physiotherapy (Belinkiff, 1971)	X		
	Bronchodilators (Haas, 1967)	X		
	IPPB (Intermittent positive pressure breathing machine)(Belinkiff, 1971)	X	X	
	Comprehensive Multidisciplinary Treatment Programs			
	Team approach treatment (Haas, 1967) (See Social/Attitudinal Life Function)	X	X	

TABLE 4-9 (Continued)
LIST OF TECHNOLOGIES APPLIED TO EMPHYSEMA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Mobility	Comprehensive care program (Fishman & Petty, 1971)(See Social/Attitudinal and Mobility Life Function)	X	X	
	Multidisciplinary rehabilitation program (Kaplan, 1970)(See Mobility Life Function)	X	X	
	Patient Education Programs			
	Patient education (Petty, 1970)		X	
	Occupational therapy programs (Berzins, 1970)		X	
	Lung Transplant			
	Single lung transplant (Allograft)	X		
	Oxygen Supplementation			
	Oxygen cane (Barach, 1970)(See Health Life Function)	X		
	Portable oxygen cylinders (Barach, 1970) (See Health Life Function)	X		
	Comprehensive Multidisciplinary Treatment Programs			
	Comprehensive care program (Fishman & Petty, 1971)(See Health Life Function & Social/Attitudinal Life Function)	X	X	
	Multidisciplinary rehabilitation program (Kaplan, 1970)(See Health Life Function)	X	X	
	Respiratory Aids			
	Maxi-myst (Petty, 1970)(See Health Life Function)	X		
	Hand-E-Vent (Petty, 1970)(See Health Life Function)	X		

TABLE 4-9 (Continued)
LIST OF TECHNOLOGIES APPLIED TO EMPHYSEMA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Occupational Therapy Programs (Berzins, 1970) (See Health Life Function)		X	X
Communication	None			
Social/ Attitudinal	Self-Care Treatment Devices (See Health & Mobility Life Functions)	X	X	
	Comprehensive Multidisciplinary Treatment Program			
	Team approach treatment (Haas, 1967) (See Mobility Life Function & Health Life Function)	X	X	
	Group psychotherapy (Dudley, 1969)		X	
	Comprehensive care program (Fishman & Petty, 1971)		X	
Cognitive/ Intellectual	None			

TECHNOLOGIES APPLIED TO COLON/RECTUM CANCER

Among persons disabled by colon/rectum cancer, the life-function area in which by far the greatest number of needs (70 percent) occurs is the health area. Predictably, specific needs primarily involve dealing with intestinal disorders. The life-function area containing the second highest number of specific needs is the social-attitudinal area, with 18 percent of the total. Specific social-attitudinal needs are fairly widespread, including social isolation and withdrawal, disturbances of body image, anxiety, and negative feelings toward treatment.

Few or no needs are reported for the life-functions of mobility, communication, and cognitive-intellectual functioning.

The distribution of technologies for dealing with life-function needs associated with colon/rectum cancer correlates closely with the distribution of needs, with 60 percent relating to health and 40 percent relating to social-attitudinal functioning. However, the small overall number of technologies within both life-function areas probably represents a current inability to deal adequately with the disabling effects of colon/rectum cancer. Within the health life-function, specific technologies include surgical procedures, radiation therapy, and chemotherapy. Within the social-attitudinal life-function, specific technologies include psychotherapy and supportive services from societies or from other individuals disabled by colon/rectum cancer.

The list of technologies applied to colon/rectum cancer is given in table 4-10.

TABLE 4-10
LIST OF TECHNOLOGIES APPLIED TO COLON/RECTUM CANCER

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Surgical Procedures			
	Total colectomy (Burdette, 1970)	X		
	Fulguration (Destruction of carinoma by electric current)(Clark & Cumley, 1975)	X		
	Rectal resection (Clark & Cumley, 1975)	X		
	Colonic resection (Clark & Cumley, 1975)	X		
	Radio Therapy			
	X-Rays (Shimkin, 1969)	X		
	Radium (Shimkin, 1969)	X		

TABLE 4-10 (Continued)
LIST OF TECHNOLOGIES APPLIED TO COLON/RECTUM CANCER

Life Function	Technology Technique	Technology Category PI	TC	EC
	Chemotherapy			
	5 - Fluoracil (Burdette, 1970)	X		
Mobility	None			
Communication	None			
Social/ Attitudinal	Psychotherapy			
	Adjustment counseling (Cobb, 1973)		X	
	Counseling for death (Cobb, 1973)		X	
	Supportive Services			
	"Reach to Recover," "Lost Chord Club," "Ostomy Association," American Cancer Society (Rosenbaum, 1975)		X	
	"Ostomy Clubs" (Dietz, 1973)		X	
	Counseling from other colostomy patients (Dietz, 1973)		X	
Cognitive/ Intellectual	None			

TECHNOLOGIES APPLIED TO KIDNEY DISEASE

Among persons disabled by kidney disease, nearly 60 percent of the life-function needs are in the area of health. Health needs of this group are extremely diverse, including, most prominently, skin disorders and urinary-tract disorders, followed by threats to normal system functioning, generalized tissue disorders, disorders of the arteries and veins, digestive disorders, intestinal disorders, and malfunctions of reproductive organs. Despite this diversity of needs, technologies for meeting them fall into only two main categories:

prosthetic devices and surgical procedures designed to deal with the primary life-threatening effects of renal dysfunction itself, rather than with complications and side-effects of the disease. Nonetheless, these technologies make up by far the largest percentage of the total technologies for meeting the needs of persons disabled by kidney disease.

Most of the other needs of persons afflicted by kidney disease are in the social-attitudinal life function. These needs are associated with psychological reaction to treatment, and involve fear, anxiety, neurosis, depression, isolation, and anger. Technologies for meeting these needs comprise most of the remainder of the total technologies applied to kidney disease. All of the technologies applied to social-attitudinal needs fall in the category of psychotherapy. The disproportionately small number of social-attitudinal technologies compared to health technologies for persons disabled by kidney disease reflects the relatively unspecialized nature of psychotherapeutic technologies compared to the highly specialized development of renal dysfunction prosthetic devices.

Persons disabled by kidney disease have very few needs in the areas of mobility, communication, and cognitive-intellectual functioning, and correspondingly few technologies have developed in these life-function categories.

A list of technologies applied to kidney disease is given in table 4-11.

TABLE 4-11
LIST OF TECHNOLOGIES APPLIED TO KIDNEY DISEASE

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Prosthetic Devices (Artificial Organs)			
	Limited care dialysis unit (Hull, 1975)	X		
	Self care dialysis (Hull, 1975)	X		
	Wearable portably artificial kidney (Bailey, 1972)	X		
	ACAC microcapsule artificial kidney (Whelpton, 1974)	X		
	Mobile dialysis unit (Whelpton, 1974)	X		
	Klung artificial kidney	X		
	R.P. kidney (Bailey, 1972)	X		
	A.B. Gambo hemodialyzer (Bailey, 1972)	X		
	Twin coil dialyzer (Bailey, 1972)	X		
	The wind-it-yourself coil kidney (Bailey, 1972)	X		
	Kiil kidney (Bailey, 1972)	X		
	Dialung artificial kidney (Bailey, 1972)	X		
	Sorption based hemodialysis (Whelpton, 1975)			
	Pediatric hemodialysis unit (Levy, 1974)	X		
Social/ Attitudinal	Psychotherapy and Counseling			
	Individual psychotherapy (Cramond, et al., 1968)		X	
	Group psychotherapy (Cramond, et al., 1968)		X	
	Family therapy		X	
Cognitive/ Intellectual	None			

TECHNOLOGIES APPLIED TO DIABETES MELLITUS

Among persons disabled by diabetes mellitus, over half the life-function needs are in the area of health. Specific health needs are very diverse, but prominent among them are problems with other metabolic dysfunctions, direct system dysfunction, and urinary tract and kidney disorders. Technologies for dealing with health needs account for nearly all of the total technologies for dealing with diabetes mellitus. Specific technologies primarily involve drug (insulin) therapy and dietary management, but also include surgical procedures, artificial organs, education, and technologies associated with renal dysfunction and coronary disease.

The social-attitudinal life-function accounts for the second highest percentage (25 percent) of needs among persons disabled by diabetes mellitus. Specific needs involve anxiety, isolation, self-destructiveness, and depression. Only one technology, a comprehensive, multi-disciplinary treatment program, is available for meeting these needs. However, this type of technology or even one less broad which provides psychotherapy or counseling is probably best suited for meeting these needs.

Communication needs of persons disabled by diabetes mellitus primarily involve blindness and other ocular problems which are dealt with by the technology of surgical procedures such as photocoagulation, vitrectomy, and retinal indentation.

The mobility and cognitive-intellectual life functions account for relatively few needs of persons disabled by diabetes mellitus. However, within the cognitive-intellectual area, deficits in the level of thinking and abstract reasoning constitute an area of significant need. Needs of this type arise as side effects of the primary disability of diabetes mellitus and are most often dealt with through drug therapy and dietary management technologies.

A list of technologies applied to diabetes mellitus is given in table 4-12.

TABLE 4-12
LIST OF TECHNOLOGIES APPLIED TO DIABETES MELLITUS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Surgical Procedures (See Communication Life Function)			
	Pituitary Ablation (Keen & Jarrett, 1975)	X		
	Photocoagulation (Xenon and Laser)(Keen and Jarrett, 1975)	X		
	Vitrectomy (Keen & Jarrett, 1975)	X		
	Retinal indentation (Keen & Jarrett, 1975)			
	Drug Therapy			
	Atromid (Keen & Jarrett, 1975)	X		
	Insulin administration (Oakley, Pyke and Taylor, 1975)	X		
	Prosthetic Devices (Artificial Organs)			
	Artificial endocrine pancreas (Albisser, 1974)	X		
	Education (See Social-Attitudinal Life Function)			
	Diabetes center: A five-day education course (Prater, 1974)		X	
	Teaching machine (MacDonald & Kaufman, 1963)		X	
	Diabetes detection and education (Etzqiler, 1968)	X	X	X
	Dietary Management (See Cognitive-Intellectual Life Function)			
	Sugar control diets (Oakley, *et al.*, 1975)	X		
	Technologies associated with renal dysfunction secondary to diabetes mellitus - (See Kidney Disease - Health)			
	Technologies associated with coronary disease secondary to diabetes mellitus - (See Coronary Heart Disease - Health)			

TABLE 4-12 (Continued)
LIST OF TECHNOLOGIES APPLIED TO DIABETES MELLITUS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Mobility	None			
Communication	Surgical Procedures			
	Photocoagulation (Xenon and Laser) (Keen and Jarrett, 1975)	X		
	Vitrectomy (Keen & Jarrett, 1975)	X		
	Retinal indentation (Keen & Jarrett, 1975)	X		
Social/ Attitudinal	Comprehensive Multidisciplinary Treatment Programs			
	Diabetic youth and family program (Smith, 1974)	X	X	X
	Diabetes center: a five-day education course (Prater, 1974)		X	
	Teaching machine (MacDonald and Kaufman, 1963)		X	
	Diabetes detection and Education (Etzwiler, 1968)	X	X	X
Cognitive/ Intellectual	Drug Therapy			
	Insulin administration (Oakley, *et al.*, 1975)	X		
	Dietary Management			
	Sugar control diets (Oakley, *et al.*, 1975)	X		

TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT

Among persons disabled by visual impairment, the greatest number of needs, as expected, is in the communication life-function. Of 48 specific needs relating to visual impairment, 40 percent are in the communication life-function. Most of the communication needs relate to reading difficulties. This finding is predictable within a society in which the ability to read is so important for normal functioning. The ability to read is, for example, the cornerstone of most educational methods within contemporary society. The second highest number of specific needs (21 percent) is in the mobility life-function.

Most of the techniques for dealing with visual impairment are found within the areas of greatest need--communication and mobility. Fifty-one percent of the techniques for dealing with visual impairment facilitate communication, and 27 percent facilitate mobility. Most of these techniques involve various sensory aids.

Approximately 19 percent of the needs associated with visual impairment are in the social-attitudinal life-function. These needs result primarily from social isolation in a world which is visually oriented. The techniques for dealing with social-attitudinal problems of the visually impaired primarily include vocational training programs, because employment seems to be particularly beneficial in reducing feelings of social isolation and dependency.

The list of technologies applied to visual impairment is given in table 4-13.

TABLE 4-13
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	None			
Mobility	Sensory Aids (Tactile)			
	The path-sounder (Proscia, 1970)	X		
	Electronic cane (Frank, 1963)	X		
	Folding cane (Proscia, 1970)	X		
	Raised line drawings (Levi, 1967)	X		
	Mobility and thermatic maps (Wiedel, 1967)	X		
	Mobility Training			
	Training tape recording (Schillina, 1967)		X	
	Mobility training program (McCoig, 1967)		X	
	Independent travel training for blind children (Quinn, 1968)		X	
	Optical aid clinic (Tann, 1969)		X	
	Low vision clinic (Cross, 1963)		X	
	Prosthetic Devices			
	Optical prosthesis (Martinne)	X		
Communication	Sensory Aids (Tactile)			
	Metal alphabet plate (Keane, 1969)	X		
	Telatouch machine (Keane, 1969)	X		
	Argone braille machine (Grunna, 1975)	X		
	Translation of ink print copy to grade two braille (Puckett, 1971)	X		
	Personal print reading machine (Moore, 1968)	X		
	The International standard manual (Keane, 1969)	X		

TABLE 4-13 (Continued)
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	The American one hand manual alphabet (Keane, 1969)	X		
	MIT Braille boss (Proscia, 1970)	X		
	Tactile communication with air jets (Mann, Baumann and Sheridon, 1969)	X		
	Sensory Aids (Auditory)			
	Pocket communicator (Proscia, 1970)	X		
	RFB (Recording for the Blind) portable disc player (Levi, 1968)			
	Sensory Aids (Visual)			
	X-Y platform for RAND designed television system (Clewett, 1971)(See Cognitive-Intellectual Life Function)	X		
	Mobile opthalmological unit (Rambi, 1969)	X		
	Speech Therapy			
	Current American tape program (talking book)(MarcFarland, 1968)		X	
	Education			
	Program instruction in braille (Heber, 1967)		X	
	A library service for the blind (Bray, 1964)		X	
	Recorded journal (Riley, 1964)		X	
	Art gallery for the blind	X	X	X
	Raven progressive matrices (Anderson, 1964)		X	

TABLE 4-13 (Continued)
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Vocational Training			
	Intensive language program for blind student (Dostert, 1965)		X	
	Tape duplication training program (Seward, 1968)		X	
Social/Attitudinal	Vocational Training			
	Instructor's guide (for teaching woodworking to visually handicapped)(Trinkham, 1963)		X	
	Industrial homework program (Hainor, 1970)		X	
	Agricultural and rural training center for the blind (Moos, 1969)		X	
	Education			
	Physical education for blind children (Buell, 1964)		X	
Cognitive/Intellectual	Sensory Aids (Tactile)			
	Compact tactile stimulator (Bliss, 1969)	X		
	Tactile television system (Batch-Y-Rits, 1969)	X		
	Sensory Aids (Visual)			
	X-Y Platform for RAND sight instrument (Clement, 1971)	X		
	Education			
	Pre-college summer orientation program (Jiuoff, 1967)		X	

TABLE 4-13 (Continued)
LIST OF TECHNOLOGIES APPLIFD TO VISUAL IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Vocational Training Taxpayer service representatives (Knoch, 1971)			

TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT

Among persons disabled by hearing impairment, the life function in which the greatest number of needs occurs is communication. Most of the communication needs involve difficulties in reading and writing, language skills, and articulation and other speech problems. Predictably, the communication life function also contains by far the greatest number of technologies for dealing with hearing impairment. Most prominent among these technologies are auditory devices, such as hearing aids, and educational programs.

The life function containing the second highest percentage of needs statements is the social-attitudinal area. The most prominent needs within this area involve social isolation and withdrawal and immaturity in social relationships. Technologies for meeting these needs include primarily vocational education and psychological intervention through clubs for persons with hearing impairments. Although none of the research sources on hearing impairment specifically mention psychotherapy for this group, such procedures presumably are appropriate for persons in this group if communication difficulties can be overcome.

Cognitive-intellectual needs of persons with hearing impairments are related primarily to learning and performance difficulties associated with the loss of one of the most important sense modalities. Special education and vocational training for the hearing impaired are the obvious and primary technologies currently being used to overcome these difficulties.

Persons with hearing impairments sometimes have needs in the mobility life-function area. These needs usually involve problems with kinesthetic motor reactions and balance. However, no technologies for dealing with these problems are described in research sources.

The life-function area in which persons with hearing impairments have fewest needs is health. Presumably because the health needs of persons in this group are not substantially different from those of persons in the general population, no specific technologies for dealing with health problems of persons with hearing impairments are described in research sources.

The list of technologies applied to hearing impairment is given in table 4-14.

TABLE 4-14
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	None			
Mobility	None			
Communication	Sensory Aids (Auditory)			
	The body hearing aid (Sanders, 1971)	X		
	Behind the ear aid (Sanders, 1971)	X		
	Auditory training unit (Sanders, 1971)	X		
	Group auditory training (Sanders, 1971)	X		
	Electrowriter (RD-1526, 1965)	X		

TABLE 4-14 (Continued)
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	In the ear aid (Sanders, 1971)	X		
	Instantaneous pitch period indicator (Delasky, 1969)	X		
	MEDESCO OL.63 hearing aid	X		
	Sensory Aid (Tactile)			
	Tactual speech aids (Picket, 1969)	X		
	Psychological Intervention			
	Mother's group aid therapy (Musiler, 1968)		X	
	Auditory training games (Prescott, 1971)			
	Education Programs			
	Sign language (Jones, 1965)		X	
	A program for teaching language to young children with central auditory disorders (Blender, 1964)		X	
	Acoupedic approach (Musiler, 1968)		X	
	Polaroid camera used in teaching language (Wallace, 1971)		X	
	Visual language (Bell, 1971)		X	
	The system sign language (Paget, 1969)		X	
	Mechanical Aids			
	Teletypewriters for the deaf (Jones, 1965)			X
	Bioelectric Techniques			
	Electrical stimulation in eighth nerve deafness (Doyle, 1965)	X		

TABLE 4-14 (Continued)
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Social/ Attitudinal	Vocational Education			
	National theater of the deaf of America (Kensall, 1969)		X	
	Psychological Interventions			
	Hard of Hearing Club (Thoms, 1969)		X	
Cognitive/ Intellectual	Vocational Training			
	Vocational Training for multiply handicapped deaf (Hurwitz, 1971)		X	
	Education			
	Special education for the deaf (Katz, et al., 1974)		X	

STATISTICAL SUMMARY OF TECHNOLOGIES DATA

Several important generalizations concerning the way technologies are applied to the problems of disability may be drawn from the data in the technologies tables. These generalizations concern (1) the distribution, according to life function, of types of technologies--environmental change--physical intervention--and training and counseling--available for meeting life-function needs, (2) the distribution, within each of the 14 specific disability groups, of types of technologies available for meeting the life-function needs of each group, (3) the total number of specific technologies available for meeting needs within each of the five life-function areas, and (4) the total number of specific technologies available for meeting the life-function needs associated with each of the 14 representative disabilities.

Distribution among the three categories of technologies varies according to life function. Figure 4-4 shows that in the areas of health, mobility, and communication, physical-intervention technologies predominate, followed by training and counseling. However, very few environmental-change technologies are reported for meeting life-function needs in these areas. In the cognitive-intellectual and social-attitudinal areas, training and counseling technologies predominate, followed by physical intervention, with few environmental-change technologies reported.

Distribution among the three categories of technologies also varies among the 14 representative disability groups. As shown in figure 4-5 technologies applied to visual impairment, cerebral palsy, emphysema, and coronary heart disease are about equally divided between physical intervention and training and counseling, with very few environmental-change technologies reported for these disability groups. Technologies applied to hearing impairment, schizophrenia, and mental retardation are primarily training and counseling technologies, followed by physical intervention for hearing impairment and schizophrenia, and environmental change for mental retardation. Among the remaining disabilities--epilepsy, colon/rectum cancer, stroke, spinal cord injury, rheumatoid arthritis, diabetes mellitus, and kidney disease--physical intervention technologies predominate. One possible conclusion to be drawn from these figures is that environmental-change technologies may be underdeveloped and under used.

Numbers of specific technologies available for meeting the various types of life-function needs also vary considerably. As shown in figure 4-6, technologies applied to health needs far outnumber other types of technologies, followed by technologies applied to mobility and social-attitudinal needs. Technologies applied to communication needs rank fourth, and technologies applied to cognitive-intellectual needs rank

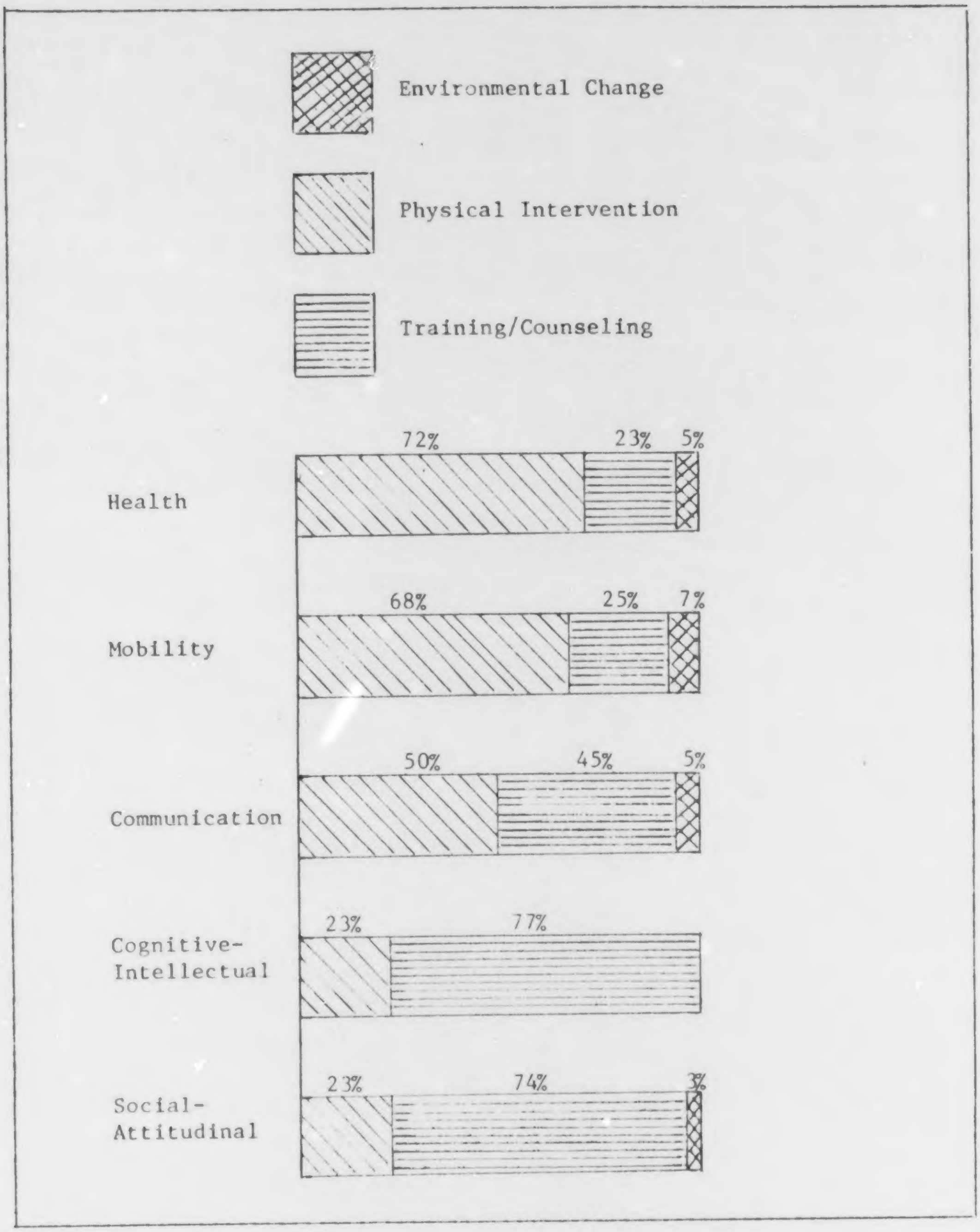


Figure 4-4. Distribution of technologies by life-function needs

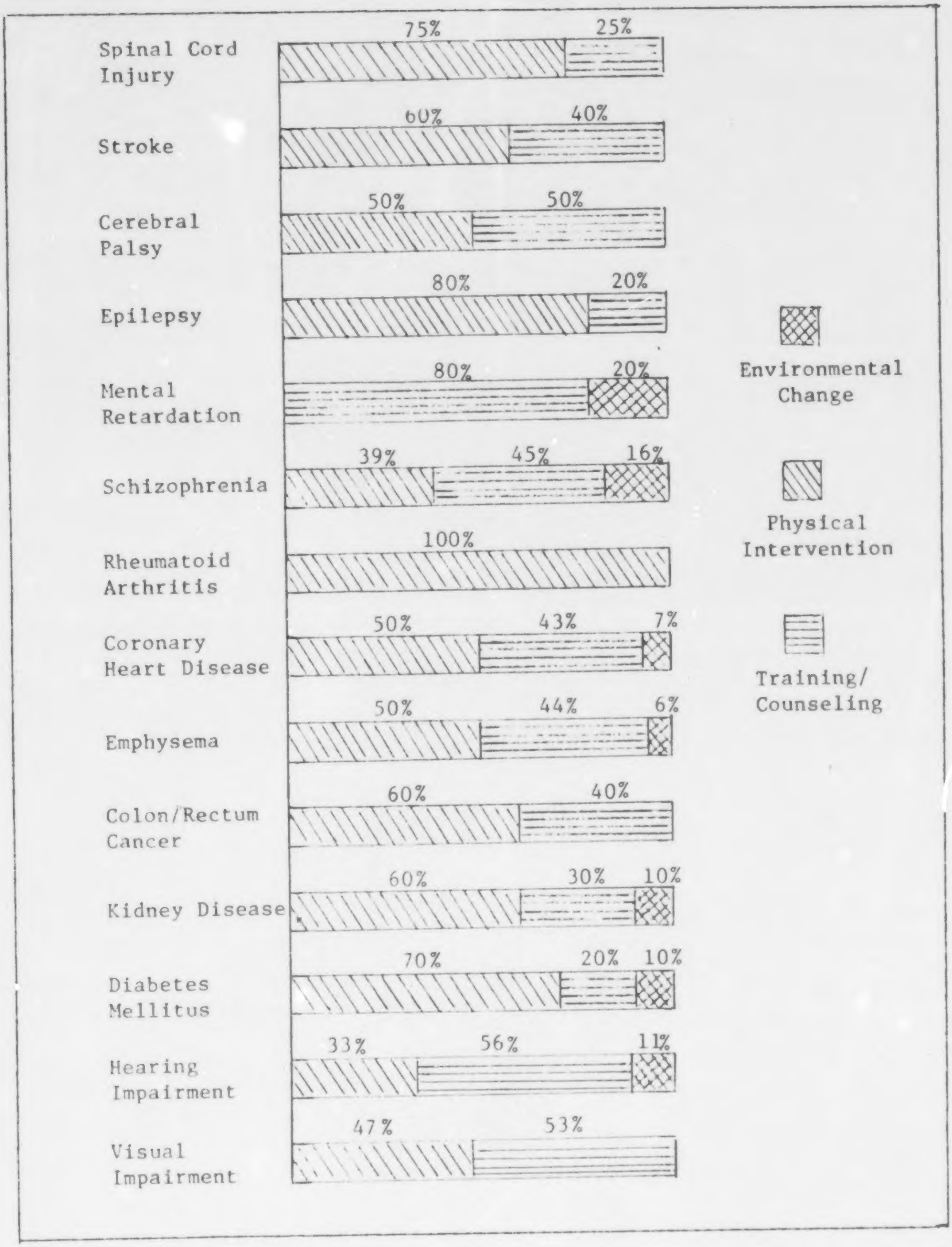


Figure 4-5. Distribution of technologies meeting life-function needs within specific disabilities

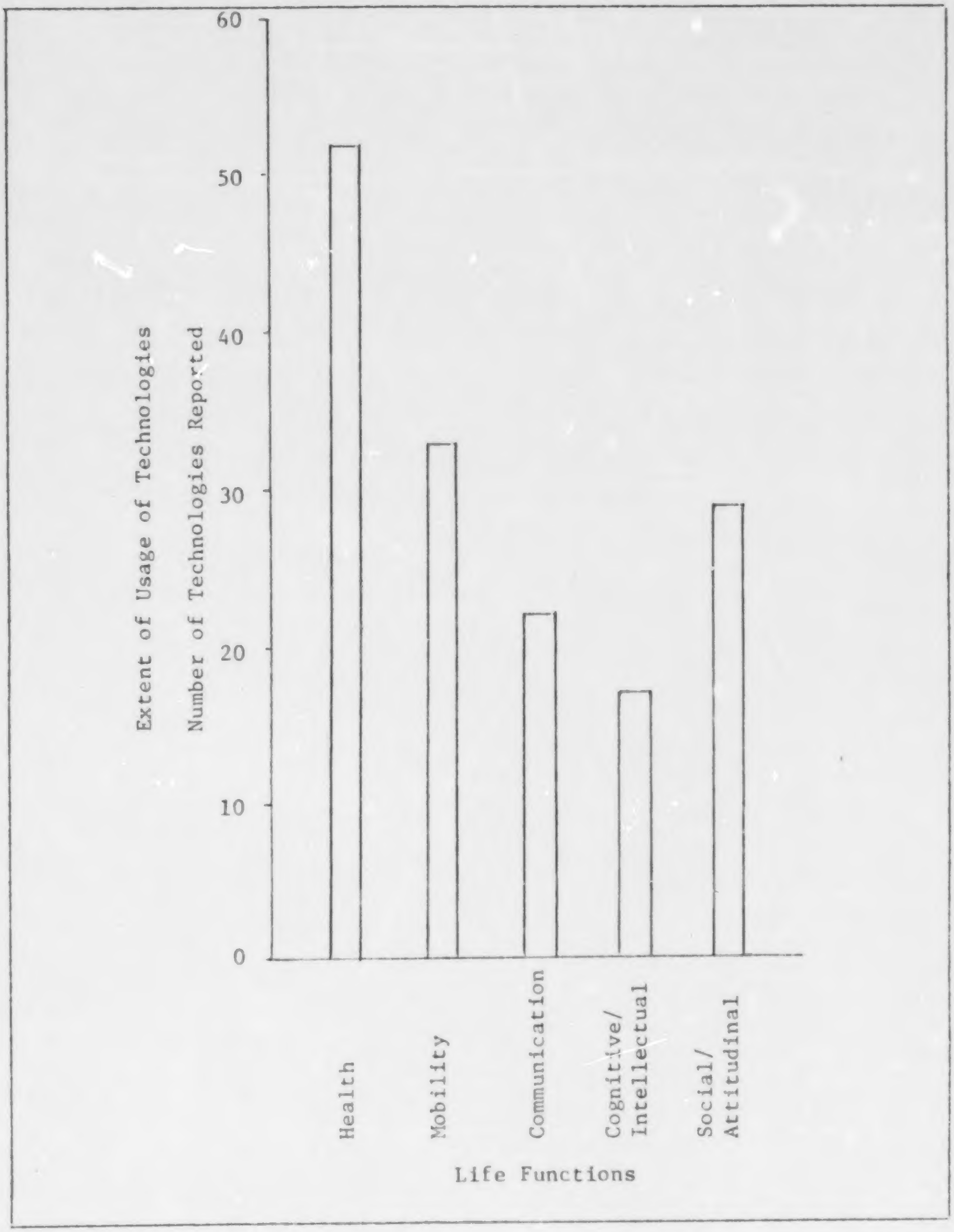


Figure 4-6. Total numbers of technologies within each life-function

fifth. These findings parallel the findings regarding the number of needs expressed for each of the five life functions.

Specific breakdowns of technologies within each of the program thrusts and the life-function impairments that the technologies eliminate or minimize are shown in figures 4-7, 4-8, and 4-9.

Numbers of technologies available for meeting the needs of various disability groups also vary. Figure 4-10 shows that the disability groups for which the greatest number of technologies are available are visual impairment, hearing impairment, emphysema, stroke, spinal cord injury, and mental retardation. In the middle range with regard to number of technologies available are schizophrenia, cerebral palsy, and disabilities in the chronic disease group--rheumatoid arthritis, coronary heart disease, diabetes mellitus, and kidney disease. The disability groups for which the fewest technologies are available are colon/rectum cancer and epilepsy. However, these estimates may be somewhat misleading because of varying levels of abstraction among techniques.

RELATIONSHIP BETWEEN NEEDS AND TECHNOLOGIES TO MEET THESE NEEDS

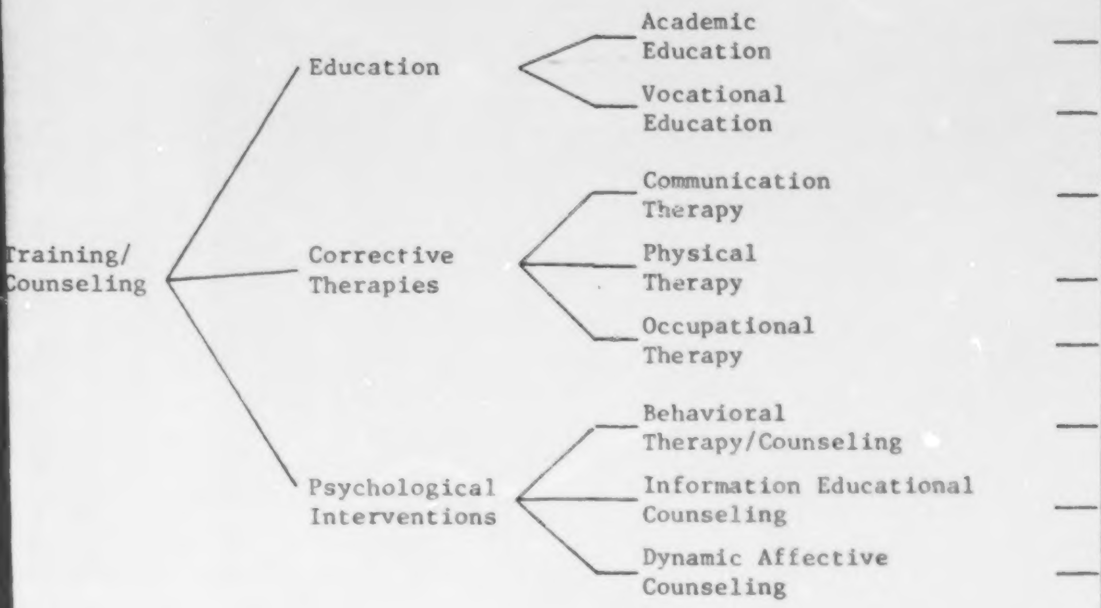
The extent to which currently available technologies meet actual needs of disabled persons is of great significance for an assessment of rehabilitation technology. To determine the correlation between these two factors, percentages of needs and technologies were cast separately in 4 x 5 matrices (life function x disability grouping category--see Life Function report) as shown in tables 4-15 and 4-16. The percentages in table 4-16 are percentages of technologies (groupings of techniques), not percentages of individual techniques. Thus, as shown in table 4-15, 6 percent of the total needs expressed refer to health needs of persons in the motor disability category, whereas, 7 percent of the total

Environmental Change		LIFE FUNCTION					Total Count
		Health	Mobility	Communica-tion	Social/ Attitudinal	Cognitive/ Intellec-tual	
Community Design	Physical Environment						
	Social Environment		3	1	2		6
Living Environment	Community Based	1					1
	Institution Based						0
Employment Environment	Physical		1		1		2
	Programs		1	1	3		5
	Financial						0
Transportation	Goods or Services						0
	People		6		2		8
TOTAL		1	11	2	8	0	22

Figure 4-7. Environmental change technologies

			LIFE FUNCTION					
			Health	Mobility	Communica-tion	Social/ Attitudinal	Cognitive/ Intellectual	Total Count
Physical Intervention	Rehabilitation Devices	Adaptive Equipment	13	12	37	14		76
		Sensory Aids		5	23		3	31
		Prosthetic Devices	15	12	3			30
		Orthotic	11	28				39
	Biomedical Change	Physical Therapeutic Agents	20	7	1	2		30
		Chemical Therapeutic Agents	23	5	3	3	2	36
		Dietary Factors	6					6
	Surgical Techniques	Reconstruction Techniques	29	6	3	2		40
		Transplantation	3					3
		TOTAL	120	75	70	21	5	291

Figure 4-8. Physical intervention technologies


raining/
ounseling
Education
Corrective Therapies
Psychological Interventions
Academic Education
Vocational Education
Communication Therapy
Physical Therapy
Occupational Therapy
Behavioral Therapy/Counseling
Information Educational Counseling
Dynamic Affective Counseling

	LIFE FUNCTION					
	Health	Mobility	Communica-tion	Social/ Attitudinal	Cognitive/ Intellectual	Total Count
Academic Education	4	2	11	6	11	34
Vocational Education			2	13	11	26
Communication Therapy		1	14		2	17
Physical Therapy	14	14	1	7		36
Occupational Therapy	1	1		11	1	14
Behavioral Therapy/Counseling	2		1	14		17
Information Educational Counseling	9			2		11
Dynamic Affective Counseling				4		4
TOTAL	30	18	29	57	25	159

Figure 4-9. Training and counseling technologies

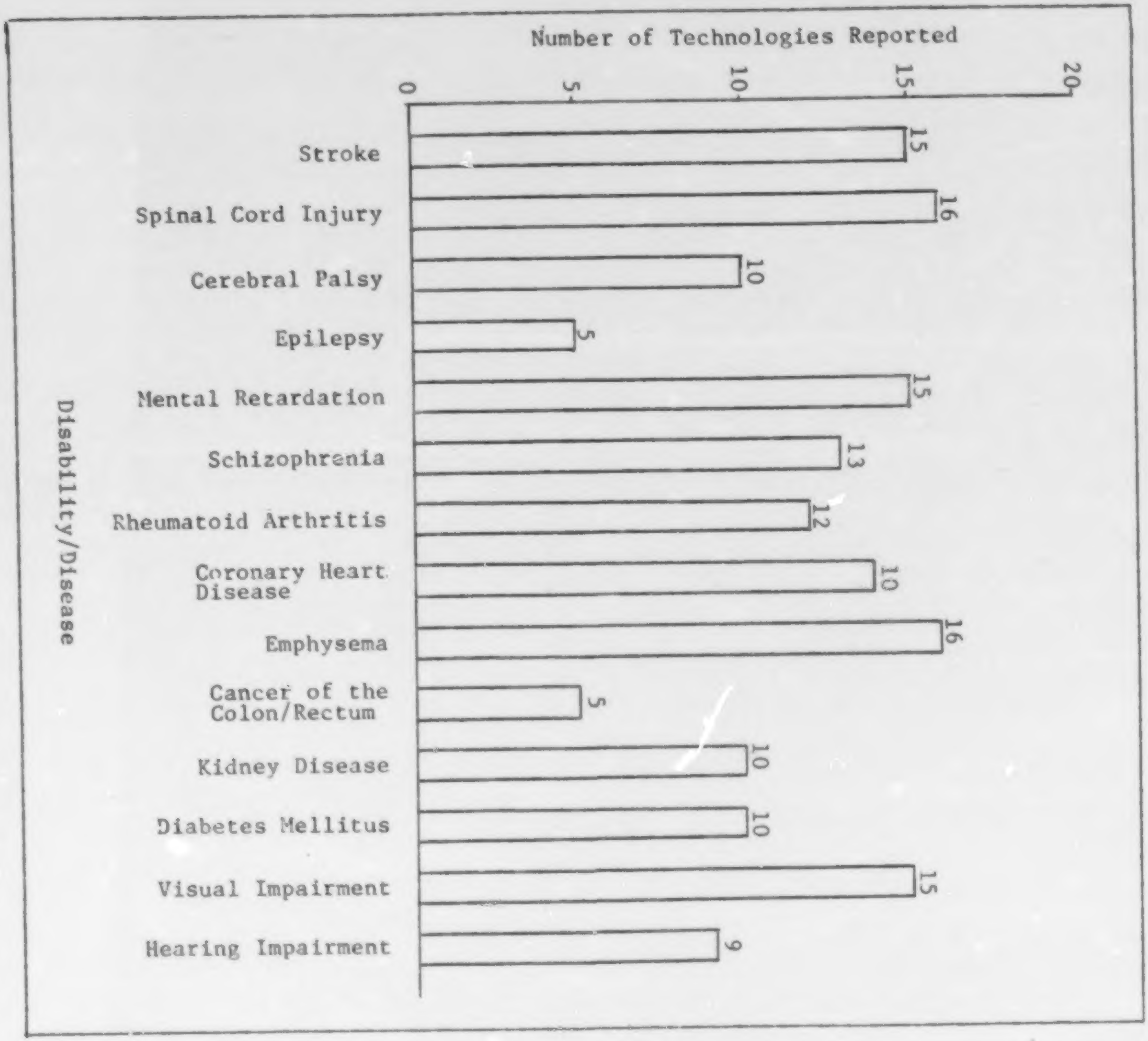


Figure 4-10. Total number of technologies used in each disability group

TABLE 4-15
SUMMARY TABLE OF NEED STATEMENT BY LIFE FUNCTION AND DISABILITY GROUPINGS*

	Disability Groupings				
	Motor	Behavioral	Chronic Disease	Senses	
Health	78 (6%)	56 (5%)	243 (20%)	9 (1%)	
Mobility	121 (10%)	34 (3%)	49 (4%)	17 (1%)	
Communication	37 (3%)	50 (4%)	15 (1%)	50 (4%)	
Social/ Attitudinal	83 (7%)	83 (7%)	115 (9%)	35 (3%)	
Cognitive/ Intellectual	14 (1%)	105 (9%)	12 (1%)	16 (1%)	
					1222 (100%)

*Motor=Spinal cord injury
Storke
Cerebral palsy

Behavioral=Mental retardation
Epilepsy
Schizophrenia

Chronic Disease=Rheumatoid arthritis
Coronary heart disease
Emphysema
Cancer colon/rectum
Kidney disease
Diabetes mellitus

Senses=Hearing impaired
Visually impaired

TABLE 4-16
SUMMARY TABLE OF TECHNOLOGIES BY LIFE FUNCTION AND DISABILITY GROUPINGS*

	Disability Groupings			
	Motor	Behavioral	Chronic Disease	Senses
Health	11 (7%)	5 (3%)	36 (24%)	0 (5%)
Mobility	15 (10%)	3 (2%)	12 (8%)	3 (2%)
Communication	5 (3%)	4 (3%)	1 (1%)	12 (8%)
Social/ Attitudinal	5 (3%)	11 (7%)	9 (6%)	4 (3%)
Cognitive/ Intellectual	3 (2%)	6 (4%)	2 (1%)	6 (4%)

153 (100%)

*Motor=Spinal cord injury
Stroke
Cerebral palsy

Behavioral=Mental retardation
Epilepsy
Schizophrenia

Chronic Disease=Rheumatoid arthritis
Coronary heart disease
Emphysema
Cancer colon/rectum
Kidney disease
Diabetes mellitus

Sesnse=Hearing impaired
Visually impaired

technologies apply to health needs of persons in this disability category.

The degree of association between needs and technologies was determined by a Pearson ρ, which was found to be 0.88. The slope of the regression line was found to be 1.0. This correlation means that the availability of technologies for treating various disabilities is closely related, at least quantitatively, to the number of needs associated with those disabilities. The regression slope of 1.0 means, essentially, that for every percentage point increase in a particular area of life-function need for a particular disability category, there is a corresponding increase in the percentage of technologies available in that area. The relationship between these factors is shown in figure 4-11. In this figure, regression line A represents a situation in which the number of technologies is closely correlated with needs; however, for every 1-point increase in needs, there is only a 1/2-point increase in technologies applicable to that need. Regression line B represents a situation in which approximately two technologies are available for every one need reported.

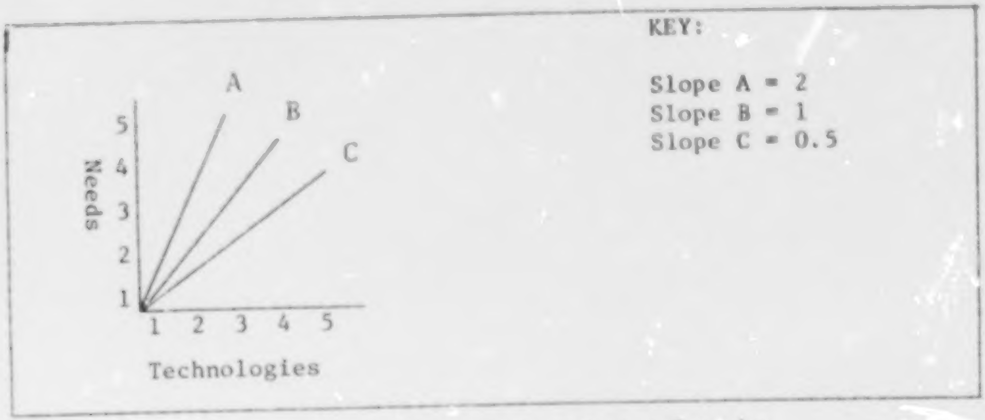


Figure 4-11. Regression slope of technologies in relation to needs

The slope of regression of 1.0 for the technologies and needs data is very good, if for every need a technology is available which satisfies that need. However, this situation is not likely. More than one technology, for example, may be required to meet a need, in which case, a slope of greater than 1.0 in the regression of technologies on needs would be desirable. Conversely, a slope of less than 1.0 would be satisfactory if a single technology is applied to more than one disability as is often the case.

The apparently high degree of association between the numbers of needs and technologies may be misleading for another reason. The quality or effectiveness of the technologies in meeting the needs associated with the disabilities is not readily ascertainable. However, it seems reasonable that the number of technologies available for meeting the needs associated with a particular disability would be positively related to success of effectiveness in treatment, and that the relative numbers of technologies applied to various needs reflects the attention those needs have received from the technological community.

CHAPTER 5
HUMAN REHABILITATION IN RELATION TO SOCIETY AND POLICY

Human rehabilitation as an endeavor of significant scale within society and government has a relatively short history. National attention was first focused on rehabilitation through the need for vocational rehabilitation of disabled veterans of World War I. The result was Congressional enactment of the Smith-Sears Act in 1918, providing vocational rehabilitation for veterans. Shortly therafter, in 1920, vocational rehabilitation for civilians also received Congressional sanction in the Federal Vocational Rehabilitation Act, also known as the Smith-Fess Act. The original appropriation authorized by this act was $1 million. At the same time, the first governmental attempts at rehabilitation research appear to have begun with a study assessing rehabilitation of soldiers wounded in World War I. Application of the research fell to the veterans' program. Until 1929, though, no substantial empirical study of rehabilitation practices throughout the country was undertaken. In 1929, the Federal Board for Vocational Education issued a statistically based study of 6319 disabled persons which concluded that half of the rehabilitation successes that occurred were a result of retraining (Berkowitz, _et al._, 1975).

Between 1920 and 1935, the original Federal Vocational Rehabilitation Act was extended several times, until it was made permanent by inclusion in the Social Security Act of 1935. At that time, the appropriation was doubled to $2 million. In 1939, the appropriation was again increased, this time to $3-1/2 million.

After being rooted in the rehabilitation of veterans, governmental concern for the rehabilitation of the disabled began to be extended to the overall problem of disability within the whole society during the early years of Franklin Delano Roosevelt's administration. During these years, legislation designed to have the primary consequence of promoting economic recovery had a secondary consequence of providing for the security needs of the elderly, the orphaned, and the blind. The report upon which Roosevelt based his legislative submissions which resulted in the Social Security Act of 1935 notes the interrelationship of social objectives.

> Economic security is a much broader concept than social insurance, embracing all measures to promote recovery and to develop a more stable economic system, as well as assistance to the victims of insecurity and maladjustment. The interrelationship of these various approaches must be kept in mind . . .
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> The field of study to which [the Committee on Economic Security, producers of this report] should devote its major attention is that of the protection of the individual against dependency and distress. This includes all forms of social insurance (accident insurance, health insurance, invalidity insurance, unemployment insurance, retirement annuities, survivors' insurance, family endowments, and maternity benefits) and also problems of providing work (or opportunities for self-employment) for the unemployed, and training them for jobs that are likely to become available (HEW, 1976).

The Social Security Act was not successful in implementing all of these "approaches" to the governmental provision for social needs of the disabled and others, but it did succeed in a number of specific objectives of the committee, including implementation of aid to dependent children, maternal and child health aid, crippled children's aid, and pensions for the aged and blind (HEW, 1976).

Further expansion of vocational rehabilitation services was provided in 1943 when the Vocational Rehabilitation Act was rewritten as Public Law 113. Between the enactment of this law and the time it was extended in 1958, Congressional appropriations grew to $23 million. A novel feature of this law was the provision, for the first time, of a means test in which services were provided on the basis of economic need of the client.

After the Office of Vocational Rehabilitation was incorporated into the new Department of Health, Education, and Welfare in 1953, support increased for a major expansion of vocational rehabilitation services. The result was Public Law 565, enacted in 1954. Although the means test for services was maintained in this law, as was the basic funding program, a much more varied system of grants was incorporated into it, and much greater provision was made for coordination among various aspects of rehabilitation services.

Until 1956, the emphasis in amelioration of disability has been on aid to the disabled person in the form of services. However, in 1956 the Social Security Act Amendments provided for aid to the disabled in the form of cash benefits.

Increased availability of rehabilitation services was mandated by Public Law 89-333 of 1965 which eliminated the means test for vocational rehabilitation and also established as a goal the availability of rehabilitation services to all handicapped persons within every state by July 1, 1975.

Current government-sponsored rehabilitation programs have evolved to a point that seems very close in philosophy and approach to the security-oriented system described by President Roosevelt's committee. The unifying theme of programs currently in effect is economic security and its relationship to individual and societal well-being.

Although criticism is frequently leveled at programs which posit economic solutions to social problems, research has shown a close relationship between economics and many social problems, including disability. Partly because of unemployment and other economic factors, poverty and disability have been shown to be interrelated. The causal relationships between poverty and disability, partly because of censusing inadequacies, have not been clarified. Nonetheless, a 1965 study (Swisher, 1971) reveals that 33 percent of all disabled families at that time had incomes below poverty level; families with a severely disabled member had a median income of only $2,124. This report also reveals that the percentage of the disabled who support themselves through employment varies inversely with the severity of the disability. Although earnings are usually lowest for those disabled the longest, a 1971 Social Security Administration survey reveals that earnings for persons recently disabled are substantially lower than those for the general population. In 1970, the mean earnings for the nondisabled amounted to $5,913, whereas the mean earnings for 50 percent of the recently severely disabled were less than $2,325 (Frolich, 1975).

One way of classifying current responses to economic and other needs arising from disability is as follows: (1) income transfer programs, such as the Supplemental Security Income program, which relieve the disabled of some of the cost burden of their disabilities, (2) medical care and assistance programs, such as the Veterans' Administration Hospital program, which provide medical payments and assistance to the disabled, (3) direct service programs, such as the Federal State Rehabilitation Program, which provide nonmedical service to the disabled, and (4) indirect service programs which devote only a portion of their resources to the disabled in the form of earmarked funds.

Historically, the two factors which have had the greatest influence on the types of rehabilitation programs enacted have been (1) the political dynamics of governmental policymaking and (2) the economic status of society at large and the disabled as a group within the society. Regardless of the specific characteristics of any policy relating to the disabled, these two factors are always present.

THE POLITICAL DYNAMICS OF GOVERNMENTAL POLICYMAKING AND DISABILITY

Policy formulation can generally be identified with the following processes: (1) rational decision-making, (2) affected individual and group reaction, and (3) governmental and social interaction. Rational decision-making stresses desired ends and logical derivation of means. Affected individual and group consideration, highlights the satisfaction of organizations and persons upon whom policies have impacts. Consideration of governmental and social interaction emphasizes the various types of policies and the consequences each type may produce.

THE ROLE OF PUBLIC OPINION

Federal legislative policies, must often be seen as a response to public demand for solution to problems or for modification of government handling of problems currently covered by policy. In the analysis of policies such as those relating to rehabilitation, public-opinion information from polls, elections, and the like, may, therefore, be valuable. Three types of information are particularly important: (1) measures of public trust in governmental decision-making processes, (2) measures of public attitude towards formulation of specific types of policies, and (3) measures of the public's role in initiating or revising policies.

THE ROLE OF SPECIAL-INTEREST GROUPS AND LOBBYISTS

Because public-opinion information from polls and elections may be difficult to gather and interpret and may fail to reveal the intensity of feeling on particular issues, this type of information may be inadequate as a basis for policymaking. In such situations, special-interest groups and registered lobbyists are often effective in conveying public demands to legislative bodies. For example, in the formulation of policy relating to minority groups such as the disabled, lobbyists influence government policy through providing legislators and bureaucrats with understandable information about public demand for policy implementation and by encouraging constituents to urge appropriate legislative action.

OTHER INFLUENCES IN THE LEGISLATIVE PROCESS

Policy formulation relating to rehabilitation may also be influenced by litigation, federal agencies, campaign contributions, and communication with constituents. Furthermore, within legislative committees, collegial values may influence decision-making through the expectation that junior members will work toward goals established by senior members (Matthews, 1960). Legislative decisions, particularly innovative ones or those relating to minorities like the disabled, must, however, be supported by appropriate national, state, and local forces. Therefore, legislative bodies which have attempted to become innovative when constituent support has been widespread have often failed when that support has eroded.

THE ROLE OF BUREAUCRATIC GUIDELINES

Policy formulation is not solely the role of legislation. Agencies in the governmental bureaucracy, including many which deal with rehabilitation and the disabled, carry tremendous power in distribution of the national budget and in interpretation of legislation. Collegial loyalty is not an important force within and among these bureaucratic departments; therefore, each agency competes for both congressional and clientele support in order to gain a larger share of the budget. At times, congress intentionally passes laws in vague and general form; at other times, laws may contain unintentional ambiguities, giving bureaucratic agencies opportunity to expand or narrow the meaning of legislation through administrative guidelines. Much recent social legislation, including laws relating to rehabilitation and the disabled, has left room for such bureaucratic interpretation. This bureaucratic interpretation minimized disruption to the agencies while they absorb new programs into present structural patterns. Interpretation is most often accomplished through the distribution of drafts of guidelines to department offices for hearings throughout the country. Once approved, a draft is revised and distributed in the federal code of regulations, and bureaucratic interpretations of legislation are established as policy.

THE ROLE OF INTERACTION AMONG NATIONAL, STATE AND LOCAL GOVERNMENTAL BODIES

State and local governments interact in several ways with federal policy in areas such as rehabilitation. Although time lapse for state adoption of federal innovation has been reduced by organizational communication, federal assistance, and litigation, a recent study suggests that state adoption of federal innovation is regional and stems from examples set by more innovative states. These states usually are highly industrialized, wealthy states with a high level of party competition and high representation in urban areas (Walker, 1969). Although poorer states may be pressured into adoption of specific federal innovations, current federal programs allow state and local governments much innovative discretion.

In order to receive funds for such programs as vocational rehabilitation, state and local governments, between 1930 and 1960, had to follow rigid federal guidelines. However, during the recession of the early 70's, the insistence of states upon fiscal relief by the federal government helped bring about enactment of the General Revenue Sharing (GRS) program, from which funds are distributed with few federal guidelines. At the same time, what some call "special revenue sharing" programs, such as the "comprehensive Employment Training Act of 1973," provide a middle ground between "loose" GRS funds and highly restrictive federal grants. Special revenue sharing provides grants to states and localities to be spent within broad categories in compliance with equal opportunity restrictions and tight reporting requirements. General Revenue Sharing has been popular because of the decentralization incorporated in it, and because it has given states and localities new resources to use in accomplishing their goals. Also, since 1974, many public assistance programs, including several for the disabled, have been federalized under the Supplemental Security Income Program, leading to greater federal support of programs for the disabled. Although accompanying federal regulations are tighter than for revenue sharing, SSI still allows considerable local control over the extent of rehabilitation services provided within state borders.

Under GRS requirements that states and localities must classify their expenditures under acceptable categories such as "libraries," "recreation," "social services," and "public safety," most of the funds appear to be being spent for politically popular causes like "public safety." However, an accountability problem occurs in a lack of precise labeling of state and local funds, and, it is likely that more federal funds than are reported are being spent in supporting traditionally state-funded areas of social service, while less money than is actually reported is going to public safety and other more popular causes. Currently, Brookings Institute, the National Clearing House for Revenue Sharing, and the Southern Regional Council are attempting to develop more precise national estimates of GRS spending.

Resolution of the accountability problem in revenue sharing is important to agencies which support rehabilitation and other social interests because state and local governments usually lack adequate tax bases to expand or sometimes even to maintain social policy responsibilities, and because special revenue sharing may tend to lower levels of federal categorical-grant spending in these social programs. Revenue sharing funds which incorporated greater accountability would (1) prevent curtailment of state and local rehabilitation programs, (2) allow state and local takeover of rehabilitation programs funded by diminishing categorical grants, and (3) allow greater spending for health and social services in general. The increased capability for local policymakers to develop health and social services for the disabled is very important.

PROBLEMS ARISING FROM THE CURRENT GOVERNMENTAL POLICYMAKING PROCESS

The diversity of influences which operate within governmental policymaking bodies has resulted in numerous problems relating to the law and the disabled.

Types of Legislation

A mass of legislation relating to the disabled has been enacted at both the national and the state levels. In general, this legislation is of three types: (1) special protective legislation and programs designed to provide compensation for disability through either financial or service support, (2) legislation which directly or indirectly restricts or discourages participation of the disabled in normal community life, and (3) affirmative action legislation designed to provide opportunity or encouragement for full participation of the disabled in community life. Despite the abundance of legislation relating to disability, there is tremendous variation from state to state in the extent and scope of such legislation.

Diversity of Legislation

The sheer mass of legislation relating to disability tends to obscure the lack of a comprehensive code of law relating to the disabled; currently there is only an assortment of discrete policies with significant gaps and overlapping provisions. One of the most important consequences of the diversity of current legislation is that there is no consistent legal definition of "disability." Although the "disabled" are not a homogeneous group, and a uniform definition of disability may not always be desirable, the difficulty of defining disabled persons as a class has hampered efforts by persons attempting to represent disabled persons in court actions petitioning for equal status for the disabled with other citizens.

The dynamics of the policymaking process have resulted in the enactment of legislation in a piecemeal fashion, with programs for the disabled growing up in response to unique problems of discrete segments of the disabled population. As a result, it is nearly impossible to catalog legislation other than programmatically. For example, only veterans may qualify for certain disability benefits from the Veteran's Administration, only persons with job-connected disabilities are eligible for workmen's compensation, and only persons who are totally disabled are eligible for social security benefits.

Protective and Custodial Tendencies in Legislation

Until recently, legislation has tended to reflect a protective or custodial approach to the disabled but that tendency may change as a result of recent federal legislation. The Rehabilitation Act of 1973, for example, expresses a national policy in favor of integrating the disabled into community life. Still, a number of "residual" problems remain as a result of the protective nature of past legislation.

A major difficulty arising from the protective or custodial tendency of past legislation has been overinclusiveness in classification of disabled persons. Although broad inclusiveness makes for simplicity and convenience in administration of laws and programs, it sometimes results in losses in quality and effectiveness of public programs which must serve very diverse needs. Moreover, because overinclusiveness in classification of disabled persons often effectively means defining them as a class in terms of a negative common denominator, disabled persons are often lumped together as merely a group of abnormal persons rather than as persons with distinctive needs.

Protective and custodial tendencies reflected in law also lead to increased dependency among disabled persons. For example, judges who must rule on competency may, because of vague definitions of competency in guardianship and conservatorship statutes, make "low-risk" judgments of incompetency of disabled persons.

TRENDS IN INFLUENCES ON THE POLITICAL DYNAMICS OF POLICYMAKING: ADVOCACY

Among the most significant recent influences entering the governmental policymaking arena are disabled persons themselves.

An increasingly vocal disabled minority is beginning to coordinate its efforts for removal of legal and social barriers to normal community life. Analogies may be drawn between the so-called "crip lib" movement and the civil rights movement among ethnic and religious minorities. The social handicaps of the disabled, like those of other minorities, have been in large part the result of both social hostility toward the disabled and a long-cultivated feeling of inferiority among the disabled themselves. Equal rights, however, are not ensured by legislation alone. The real value of legislation is in its administration and enforcement. However, until recently, the disabled minority has been forced to seek enforcement action in courts for such measures as removal of architectural barriers and accessible mass transportation (notwithstanding federal legislative mandates to the states to take such steps).

Advocates for the disabled agree that the basic obstacle to equality is attitudinal. It is impossible to measure the extent to which prejudicial community attitudes toward the disabled have been reinforced by the laws which single out disabled persons for either differential or preferential treatment. But it is clear that the movement on behalf of the disabled is toward programs and forms of assistance that are incentives, not obstacles. to participation in community life.

One promising trend is reflected in a new program for the disabled included in the Developmentally Disabled Assistance and Bill of Rights Act which mandates states to set up, by October 1, 1977, programs for the protection and advocacy of legal rights of persons with developmental disabilities.

Because some federal agencies appear to have been slow in implementing federal legislation requiring affirmative action, the major thrust of advocacy efforts on behalf of the disabled is being directed toward judicial enforcement of the national policy of anti-discrimination and integration of the disabled in the community. Advocates for the disabled point out that rights to vote or to secure employment cannot be exercised effectively unless physical barriers are removed, and affirmative action is taken consistent with legislative directives to construct accessible buildings and to provide accessible mass transportation.

Probably the greatest overall single defect revealed by a survey of federal and state legislation relating to the disabled is not the lack of laws, but the lack of a comprehensive and effective means of administering those laws. There is, for example, a need for centralization of compensation plans for the disabled to eliminate waste and to ensure maximization of resources.

THE ECONOMICS OF DISABILITY

Although the internal dynamics of policymaking within governmental organizations greatly influences policy relating to disability, economic considerations--the second major set of determining factors in policymaking for the disabled--are often of equal or greater importance in determining policy. Because economic indicators are so readily quantifiable, they are often used as measures of capability, need, and evaluation in policymaking. In addition, because of the demonstrated association between poverty and disability, economic factors in policymaking for the disabled weigh particularly heavily.

The costs of disability to society are many and varied. They include lost output of goods and services, lost output from nonmarket labor (homemaking), and economic and emotional costs of dealing with disability. Disability influences the level of economic activity in the nation, and the level of economic activity influences disability.

DISABILITY DEFINED

A work disability may begin with a disease, a pathological condition, or an accident. This may, in turn, lead to impairment, defined as a physiological or anatomical loss or other abnormality (Nagi, 1969). Such an abnormality can give rise to a limitation in mental or physical functioning which may or may not be classed as a disability, depending on the person's age, sex, race, education, and image in the eyes of himself and others (Worrall and Berkowitz, 1975). Because of the significant effect of such environmental factors in disability, however, engineering breakthroughs and education may minimize the loss associated with an impairment (The Urban Institute, 1975).

CLASSES OF WORK DISABILITY

The 1966 Social Security Survey of Disabled Adults produced estimates that 17.2 percent of all noninstitutionalized persons between the ages of 18 and 64 were disabled, according to three categories of work disability (Haber, 1968). These categories include (1) severe disability--inability to work regularly, (2) occupational disability--ability to work regularly, though not at the same job as before the onset of disability, or inability to work full-time, and (3) secondary work limitations--ability to work regularly and full-time at the same occupation but with limitations in the kind or amount of work (Haber, 1966).

ECONOMIC INFLUENCES UPON PARTICIPATION OF DISABLED PERSONS IN WORKFORCE

A followup survey by the Social Security Administration in 1972 (limited to noninstitutionalized persons between the ages of 20 and 64, a total of 106 million persons) reveals a decline in the prevalence of disability from 17.2 percent in 1966 to 14.6 percent in 1972 (15-1/2 million persons). The prevalence rate for severe disability, however, increased from 5.9 percent in 1966 to 7.3 percent in 1973, possibly indicating that persons who had considered themselves occupationally disabled in 1966 considered themselves severely disabled in 1972. Changes in the economy may have been responsible for the shift. Between 1966 and 1972, unemployment for the noninstitutionalized population increased 2.1 percent, perhaps indicating that in the less favorable job market, it had become more difficult for a disabled person to find and hold employment.

The number of disabled persons, their employment rates, earnings, and income, and the probabilities for their rehabilitation are all affected by economic conditions. For example, a person with an impairment who considers himself nondisabled when economic conditions are good and the labor market favorable may consider himself disabled when the economy is slack and the labor market poor. In addition, because physical and mental handicaps constitute a barrier to successful labor-force participation, the disabled often withdraw from the labor market during extended periods of economic deterioration. Those who do participate in the labor force during such times may face unemployment rates twice as high as those for the nondisabled population, lower wages, and availability of only part-time employment. They may also be forced to accept jobs which do not fully utilize their skills. These conditions cause an increase in the emotional costs of disability and a decrease in the probability for successful rehabilitation.

ECONOMIC CONSEQUENCES OF REDUCED PARTICIPATION OF DISABLED IN WORKFORCE

A serious long-term effect of a slack economy may be an increased demand for transfer payments from such sources as disability insurance. Acceptance of this type of support over an extended period may cause the disabled to develop a preference for transfer payments as opposed to competition in the labor force. Therefore, because of economic considerations, rehabilitation programs which produce returns for society which are demonstrably greater than their costs are likely to expand in the future.

ECONOMIC EVALUATION OF POLICIES RELATING TO DISABILITY

One frequently used means by which policymakers evaluate the merits of social investments is through benefit-cost analysis, a method for comparing program benefits to costs for alternative use of allocated funds. Programs with a benefit-to-cost ratio greater than one become candidates for social investment. However, the practical usefulness of benefit-cost analysis is often limited because of unquantifiable external benefits and costs, inadequate data, lack of control groups, and varied assumptions employed during analysis. Particularly in allocation of indirect costs of rehabilitation, benefit-cost analysis should be used cautiously, and it should be used as only one input in decision-making.

The costs of programs may be evaluated in both economic and programmic terms. Economic estimates are, however, somewhat intangible. For example, the transfer to money from a nondisabled taxpayer to a disabled person is not considered by some to be a true economic cost to society. Programmic costs are more concrete. Between 1967 and 1973, total public and private transfer and medical costs for disability programs increased from $38.7 billion to $80.8 billion. When price-level changes during these 6 years are taken into account, total expenditures for transfers and medical care for the disabled increased 54 percent in real terms. This increase indicates an expanding public role in the support of the disabled population.

THE IMPACT OF PROPOSED POLICIES UPON THE ECONOMICS OF DISABILITY

Decisions made by legislative bodies in programs such as those producing national health insurance, a negative income tax, national no-fault accident insurance, and national temporary disability insurance might radically change the structure of disability programs. National health insurance, for example, could eliminate programs like Medicaid and alter the whole system of delivery of medical services. A negative income tax could eliminate income-support programs and augment income maintenance programs. National no-fault accident insurance could eliminate workers' compensation plans and some public assistance medical programs for accident victims. Temporary disability insurance could augment current programs and reduce the probability of long-term disability (Berkowitz, Worrall, and Rubin, 1976).

Regardless of the programs in effect at any particular time, a strong economy with low unemployment rates is one of the most important factors in reducing the impact of work disability. The disabled have a vital stake in a strong economy because availability of both opportunities for employment and funds for programs depends upon the path the economy takes.

THE RELATIONSHIP BETWEEN SPECIFIC POLICIES AND REHABILITATION TECHNOLOGY, THE DISABLED, AND SOCIETY

The interaction between governmental policymaking forces, economic forces, and other social forces has resulted in a variety of specific programs and policies relating to the disabled. After these programs and policies are enacted, they have far-reaching consequences not only for disabled persons and their families but for other rehabilitation technologies, for society, and for other societal policies and programs. The dynamic interaction of all of these factors is a necessary consideration in policymaking. This relationship is illustrated in four major areas in which legislatively mandated policies or specific rehabilitation technologies are being applied to the problems of disabled persons. These representative areas include (1) income maintenance, (2) public education, (3) housing, and (4) transportaiton.

INCOME MAINTENANCE AND THE DISABLED

Among programs designed to alleviate the handicapping factors associated with disability, programs which provide direct financial support to disabled persons and their families are of particular significance. These programs have broad applicability throughout the spectrum of disability, and because they are economic programs, their costs and results are more comprehensible to the public than are those of some other programs. This type of economic interaction between the individual and social programs is generally referred to as income maintenance.

Income maintenance (IM) or income security programs are public or private programs designed to compensate an individual or his dependents for income losses resulting from involuntary unemployment, retirement, or disability. Although persons may receive some "in-kind" benefits in the form of goods and services the term "IM" refers to some form of actual cash disbursement to a person. Medicare and Medicaid entitlements are, however, often considered part of the IM system because they enable a person to pay his medical bills and because they are part of the basic social security entitlement.

Types of Income Maintenance Programs

Traditionally, IM programs have been of two types: (1) insurance programs based on contributions by the insured and his employer, and (2) assistance programs based solely on need regardless of prior contributions. A third form of IM, the tax credit for the working poor, was instituted by the federal government in 1976. Currently, both public and private insurance and assistance programs are available. However, in the past half century assistance programs have passed almost entirely into the public domain. Private insurance programs such as disability insurance and workmen's compensation remain strong but limited in scope of coverage. This limitation and the impracticality of an individual's securing adequate private coverage for "catastrophic" disability or for lifelong disability beginning at birth indicate a future shift toward public programs of insurance as well as assistance (Berkowitz, 1974).

Social insurance in the United States today includes such diverse programs as railroad retirement and veterans benefits, but the most important programs for the disabled are the federally administered social security and Medicare programs. The most important of the public assistance programs are Supplementary Security Income (SSI) and Medicaid, jointly administered by the federal government and the states.

Costs of Disability Insurance

Of all social insurance programs, disability insurance is currently the least costly, amounting to $11 billion of the total $133 billion for all types of social insurance. (This $133 billion figure represents three quarters of the total federal expenditure for income security and one third of the total federal expenditure for all purposes.) However, the total federal expenditure for IM for the disabled is actually much higher than $11 billion. In addition to disability insurance,the disabled also may receive benefits under old-age and survivor's insurance, Medicare and Medicaid, SSI, and Social Security dependent's benefits. Currently, 4.6 million persons receive federal disability insurance benefits of whom 2.6 million are disabled workers and 2 million are dependents.

Criticisms of Income Maintenance Programs: Insurance vs. Assistance

The coexistence of assistance programs and insurance programs has become a major source of controversy. Current assistance programs are stigmatized as a "dole," particularly by persons whose benefits derive from employee-employer contributions to insurance programs. Frequently, insurance benefits amount to little more than the assistance benefits realized by persons who have never worked or contributed.

Hence, demands have been made for a restructuring of the IM system.

The original hope of the framers of the social security system from its inception was that the insurance coverage could become very nearly universal and that assistance programs would gradually be reduced to a minimum. This, however, has not been the case, and both insurance and assistance programs have continued to grow. Even without further program changes, both are expected to expand further. Disability insurance was added to the basic Social Security insurance program in 1957. Then, largely as a result of the inadequacy of coverage both of private disability-pension funds (particularly for non-work-related disability) and of the basic minimum social security benefits, SSI was enacted in 1974.

As a result of changes in IM systems so far, federal and state expenditures for IM for the disabled (not including dependents) are expected to increase from $8.6 billion in 1967 to $116 billion in constant (1967) dollars by 1990. Moreover, without further changes in the benefit structure, the public assistance portion of this amount will increase relative to the social insurance portion.

Criticisms of Income Maintenance: Eligibility

Currently, 3 million disabled persons receive social security benefits, and 1.9 million receive SSI, with 610,000 persons receiving both social security and SSI benefits. A major criticism of the IM system concerns the definition of disability currently used to determine eligibility. In order to qualify for either program, a person must be demonstrated incapable of earning at least $230 a month regularly, because of physical or mental impairment. Mere unemployment, regional job-market peculiarities, or a physician's testimony is not considered evidence of incapacity. This definition, although functional in its simplicity and administrative efficiency, is, for several reasons, inadequate for equitable assignment of benefits. For example, a person who can actually earn $230 per month is no longer entitled to SSI and Medicaid benefits and may consequently be worse off than an individual who earns much less and retains such benefits. Also, because social security and SSI benefits are assigned without regard to the extent of a person's disability, a partially disabled person capable of earning some money while retaining SSI and Medicaid benefits may be much better off than a more severely disabled person who has necessarily higher living expenses. The current benefit structure, in other words, takes no account of the "disability increment," the portion of an individual's living costs (medical and other) which are necessary for overcoming or compensating for his disability.

PUBLIC EDUCATION AND THE DISABLED

Public education, like income maintenance, is an area of interface between policy, the disabled, and society which cuts across the entire spectrum of disability. Moreover, public education is an area of early and continuing interaction between disabled persons and society and it is an area of interaction which markedly increases the visibility of disabled persons in society. Current policies incorporate a committment to absorption of all except the most severely handicapped disabled persons of school age into public school systems, The consequences of this commitment, not only for the schools and disabled persons but for society, are tremendously important.

The area of public education concerned with education of disabled persons is generally referred to as "special education." This field has expanded and developed significantly during the past 25 years. Growth is evident in increased enrollment, increased funding, expanded judicial and legislative support, new service-delivery programs, and expanded personnel-training programs.

Enrollment in special-education programs has increased 700 percent during the past 25 years. It will doubtless increase even more as a result of judicial decisions and federal legislation such as the Education of All Handicapped Children Act of 1974. This act guarantees publicly funded education for all handicapped children. Overall, federal funding in support of public education for the handicapped has increased 300 percent since 1970. However, an additional 400-percent increase will be required by 1980 as a result of a projected 2.4 million increase in the number of children requiring special education. Much of this increase will be needed for new programs which, though costly, will perhaps be more cost-effective than current programs. One promising new program is directed towards reassessment of handicapped children previously considered uneducable. Others such as the Early Period Screening, Diagnosis, and Treatment Program and Head Start are directed towards early intervention and treatment. Vocational training, too, is receiving closer attention as a result of a Bureau of Education for the Handicapped report indicating that only 25 percent of handicapped high school graduates secure adequate employment.

Continued support and funding for special education is, nonetheless, problematic. On the one hand, political and economic pressures may lead to a decrease in support and funding and, consequently, to a decrease in quantity and quality of services. On the other hand, these same pressures may lead to increased cost-effectiveness in special-education programs and may not necessarily lead to a decline in quantity or quality. Regardless, the future of special education will be determined by attitudes of the general population as reflected in government policy.

TRENDS IN SPECIAL EDUCATION

Recent federal policy on special education reflects a trend towards increased funding with fewer restrictions. Such a policy, however, may pose a threat to special-education programs. With loss of control over state and local expenditures, the federal government may no longer be able to ensure equalization of services among various regions of the country. Whether or not current and future governmental policies result in uniform, high-quality services in special education depends primarily upon consumer influence.

Increased consumer involvement in special-education planning and service-delivery is evident on a number of fronts. The Developmental Disabilities Act of 1975 requires that handicapped persons and parents of handicapped persons be included on state advisory councils. The Education of All Handicapped Children Act requires that the handicapped children and their parents be involved in all decisions regarding evaluations, placement, and follow-up of the child. In addition, parents of handicapped children are working more actively with professionals and paraprofessional in securing education and services for themselves and their children.

Resources Needed for Special Education Programs

Of direct and immediate concern to all persons involved in special education is the availability of resources for support of current and future programs. Statistical analyses show a 199-percent increase by 1980 in the number of handicapped children to be served by special-education programs. The projected increase is due to recent court decisions and legislation making public education for all handicapped children mandatory, and to increase delivery of services to certain groups, including handicapped secondary school-age student and the trainable mentally retarded and emotionally disturbed. Somewhat offsetting these increases are three factors: (1) the theoretically greater availability of space and resources for the handicapped due to a projected drop in the number of school-age children over the next 10 years, (2) the availability of a sufficient number of teachers at least partially trained in special education, and (3) the trend towards less costly programs such as placement of the less severely handicapped into regular classrooms. Nonetheless, the increase in the number of persons to be served, the need for more specialized training for teachers, inflation, and an increase in high-cost services such as training for the severely mentally retarded and emotionally disturbed will call for at least double the 1976 expenditures by 1980.

The greatest need for additional funding is in the area of in-service training for the 60 percent of teachers currently employed in special education who do not meet special-education certification standards, and for continuing education for the 40 percent who do.

Sources of Funding for Special Education

State and local governments have long provided most of the funding for special education, but they are approaching a maximum tax base for education now. Therefore, future additional funding probably will have to come from the federal government. Since 1960, funding for the Bureau of Education for the Handicapped has increased 366 percent, and federal contributions to state and local government special-education programs are expected to increase 400 percent over the next decade as a result of the Education for All Handicapped Children Act. Whether such a federal commitment will continue remains to be seen.

Judicially Mandated Policies

Along with increased funding, judicial and legislative actions have played a vital role in the expansion of special-education services. The Due Process Clauses of the 5th and 14th amendments to the United States Constitution and the Equal Protection Clause of the 14th amendment have been the basis of numerous precedent-setting decisions concerning education of the handicapped. In general, these decisions have called for programs to be based on individualized assessments of handicapped persons and for reallocation of funds to ensure the compliance with the following principles. (1) All handicapped persons have a right to free public education, regardless of the severity of their disabilities. (2) All handicapped persons can, at any point in their lives, benefit from an education program. (3) To ensure that handicapped persons will have a chance for cure or improvement of their conditions, they have a right to individualized treatment in humane environments and minimally restrictive programs. (4) Due process procedures must be followed prior to "labeling" and placement of handicapped persons. Moreover, these due process rulings are retroactive, providing for re-evaluation of individuals already labeled and placed.

Legislatively Mandated Policies Related to Special Education

Legislative response, on both the federal and state levels, to recent court decisions has resulted in strengthening and reaffirming the rights of handicapped persons. At the federal level, the resources of the Bureau of Education for the Handicapped have been greatly increased to provide for research, for development of new programs, and training of personnel. Also, several highly significant pieces of legislation have been enacted. The Education of All Handicapped Children Act is considered the most important of these. It calls for the federal government to bear a gradually increasing share of the per-student cost of special education, reaching and stabilizing at the 40 percent level in 1982. It provides for a shift in focus of special-education research to the severely disabled and previously unserved populations, and it specifies that services are to be made available for children from ages 3 to 21. It also contains specific directives concerning pre-school incentives, individualized programs, personnel development, and formation of state planning and advisory boards.

Another highly significant law, the Education of the Handicapped Act, also reflects the shift in focus towards the currently unserved handicapped population; this act calls for increased early education and consumer involvement as well as for the development of state plans which guarantee delivery of services to all handicapped children. Other federal legislation ensures that priority in vocational rehabilitation programs is given to the most severely disabled and protects the rights of the handicapped in areas such as maternal and child health care, transportation, and home-buying.

State legislatures have expanded education codes to establish guidelines for assessment and placement of the educable mentally retarded (EMR), and 21 states have passed laws calling for compulsory special education. In addition, a number of states have enacted statutes covering architectural barriers, bilingual education, child advocacy proceedings, program accountability, and many other issues in special education. In the development of such legislation, a particularly valuable sourcebook has been State Law and Education of Handicapped Children, Issues and Recommendations (1971) by Weintraub, Abeson and Braddock. This text includes both a model law and the following specific recommendations for legislation: (1) required public education for all handicapped children, (2) re-examination of systems of classifying the handicapped, (3) provision for educational services to handicapped youths from birth to 21 years of age, (4) annual re-evaluation of each child, (5) due process guarantees for children and their families when adjustments to "normal" activities are made, (6) free special education in public schools, (7) state absorption of educational costs beyond funding equal to expenditures for a normal child, (8) assured delivery of full educational services from classroom to residential instruction, (9) development and support of recruitment programs for trained personnel, and (10) school construction in compliance with state regulations regarding architectural barriers.

Service-Delivery Models in Special Education

In the course of the development of federal and state special-education programs, the topic of most serious debate has been the relative effectiveness of special classes for the educable mentally retarded (EMR) and integration of these children into regular classrooms. Until the mid-sixties, 90 percent of EMR children in school were placed in special classes. Recently, however, several authorities have argued for inclusion of EMR children in regular classrooms. Such placement, they contend, expands the social development of the retarded children, enhances the attitudes of the nonretarded children, and minimizes the potential damage resulting from misplacement of borderline, minority, and disadvantaged children. Proponents of special classes, on the other hand, argue that the unique physical and educational needs of the severely retarded child cannot realistically be met in a large regular classroom. Moreover, they note that attitudes and values of teachers are crucial in determining proper placement for a retarded child with the implication that many regular classroom teachers are not attitudinally equipped to cope with EMR children.

One proposed solution is one which incorporates both individualized instruction and normal settings (the resource classroom approach). Although little empirical research has been done on this issue, preliminary findings in one study show more positive results from this approach than from either a wholly segregated or a wholly integrated approach. Resolution of the issue, however, demands comprehensive research into the needs of the child and the relationship of these needs to the physical and social environments and to values and attitudes of parents and teachers.

The current trend in special education is toward provision of educational conditions as nearly normal as possible. Many schools now place handicapped children in regular classrooms for instruction in specific skills and abilities in the "resource room" (Jenkins and Mayhall, undated). Other schools use the "consulting teacher" approach. In these schools the child is placed in a regular classroom where he follows an individualized program of instruction developed for him by a consulting teacher (MacKenzie, 1973). In addition, two federally-funded model programs which emphasize individualized instruction are now under way. The Child Development Consultant (CDC) program training at the master's level for specialists who offer consultation with and in-service training for regular school personnel. Programs based on such consultation have resulted in supportive, individualized instruction for all children in the schools. The Handicapped Children's Early Assistance Program offers individualized programs for children from ages 0 through 8, as well as training for parents. These programs are under way at over 200 model "First Chance" centers throughout the country.

Despite the trend towards "mainstreaming" handicapped children into regular classrooms, segregated self-contained classrooms still exist for the severely handicapped who function best in such environments. In these situations children are grouped either according to type of disability or according to age.

Manpower Needs in Special Education

Although there is some controversy over whether the need for more educations of the handicapped should be met by loosening requirements or by training more specialists, there is no dispute over the absolute need for more teachers for the handicapped. Federal and state funding of teacher-training programs has provided the greatest impetus toward filling this need. By 1970, 400 colleges and universities offered training in special education (in contrast to the 70 which did 20 years ago), and programs at 300 of these schools were federally funded. Nonetheless, a major shortage of special-education personnel, both professional and para-professional, still exist. Currently, the area of greatest need is in early education of handicapped children followed by education of minority and bilingual handicapped children and gifted children. Exact estimates of needed manpower are not, however, currently available because of disagreement about needs of handicapped children and the multiplicity of special education programs. Still, the overall need for special educators is indisputable and must be met through federal, state, and local funding of training programs.

TRANSPORTATION AND THE DISABLED

Because of the widespread prevalence of mobility needs among disabled persons, transportation is an area of great concern for policymakers interested in reducing the handicaps associated with disability. Legislative bodies, government agencies, and the judiciary have been responsible for general policies and programs relating to transportation for disabled persons. In addition, both public and private organizations in various areas of the country have been experimenting with innovative transportation systems for the disabled.

The number of persons with disabilities which prevent their using public transportation is, according to the

Department of Transportation (DOT, 1973), indeterminate. The Department of Health, Education, and Welfare (DHEW) estimates that 13.4 million disabled persons have transportation difficulties, and the Urban Mass Transportation Administration (UMTA) estimates that five million disabled persons are totally unable to use public transportation. An estimate of the number who will be affected in 1985 shows these figures to be increasing.

Physically and mentally disabled persons travel only half as much as the nondisabled because of physical and operational barriers. Lack of transportation affects the disabled primarily in the area of employment, but improved transportation systems increase not only employment opportunities but also social opportunities and personal stability for disabled persons.

LEGISLATION RELATING TO TRANSPORTATION FOR THE DISABLED

The role of government in improving transportation for the disabled through legislation has been ineffective. Statutes are generally aimed at specific transportation barriers, but related barriers remain to impede transportation. Five federal laws contain provisions which specifically apply to accessible transportation for the disabled; among these five, only two--the Amtrak Improvement Act of 1973 and the Department of Transportation and Related Agencies Appropriations Act of 1975--specifically state that transit systems must be accessible to the disabled. Moreover, interpretation of such statutes often provides loopholes which inhibit enforcement. The Urban Mass Transit Authority, an organization within DOT charged with codifying requirements covering transit systems, has not been very effective. The agency's proposed regulations, however, present three problems: (1) the UMTA fails to commit resources for the development of accessible transportation, (2) the agency does not encourage the use of new technology in the development of more accessible systems, and (3) the agency has not clearly identified the needs of the disabled. Because of these and other problems, the UMTA has not issued final regulations.

Airline transportation accessibility presents a particularly difficult problem because of safety requirements affecting both disabled and nondisabled passengers. The main problem occurs, according to the Federal Aviation Administration (FAA), in the disruption by the disabled of emergency-evacuation procedures. Therefore, in 1974, the FAA proposed regulations stipulating quotas and seating arrangements for the disabled. The proposed regulations have attracted considerable protest, and final regulations have not been issued.

Two other acts are of potential benefit to disabled travellers. The Federal Highway Act of 1973 authorizes federal grants to nonprofit transportation agencies serving the disabled. In providing capital for such service, the act binds grant recipients to a 5-year commitment to continue transportation service for the disabled. Under this act, projects are selected by each state, subject to approval by the UMTA. The National Mass Transportation Act of 1974 requires mass-transit systems receiving federal aid to provide reduced-fare service for the disabled; benefits to the disabled from this act are, however, dubious because so many physical and operational barriers prevent travel by the disabled at any cost.

RESEARCH RELATING TO TRANSPORTATION FOR THE DISABLED

Some research is being carried out to determine the best way to reduce transportation barriers for the disabled. In 1974, DOT launched a $1.4 million research program to determine the cost-benefit tradeoff between modifying conventional mass-transit systems and designing new specialized systems to meet the needs of the disabled. To date, three studies have been undertaken: a "BART Impact Study," a "Study of Physical Barrier-Free Transit for the Elderly and Handicapped," and a study of "Small-Bus Design." An additional DOT program is now testing concepts underlying the design of special buses to accommodate the disabled.

TRANSPORTATION PROVISIONS WITHIN CURRENT GOVERNMENT PROGRAMS

Several other governmental programs have the potential to support transportation services for the disabled. The Vocational Rehabilitation Program, The Medicaid Program, and the Developmental Disabilities Program all encompass transportation for the disabled, but because transportation is only a secondary thrust of these programs, their contributions are small.

JUDICIAL INTERVENTION IN TRANSPORTATION FOR THE DISABLED

There have been numerous attempts by the judiciary to resolve the issues involved in accessible transportation. In litigation, the disabled argue that transit authorities are required by law to provide them with transportation, and transit authorities, in turn, contend that such matters are left to their own discretion. Individual court decisions have favored each side, and no definitive decision has been arrived at.

GENERAL TRENDS IN TRANSPORTATION FOR THE DISABLED

The future of accessible transportation for the disabled seems to indicate five major alternatives: (1) upgrading of present or planned systems by removal of physical barriers, (2) providing door-to-door service through a minibus service, (3) doubling the present bus fleet through an improved fixed-route service, (4) providing transit stamps for use as bus fare for elderly and disabled persons below a certain income level, (5) serving a select group of disabled through a "coupon taxi service." These alternatives aim at examining the modification of transit systems in relation to the development of specialized services for the disabled. Specialized services appear to be advantageous; however, the DOT has concluded that more information is needed about such services. Moreover, though specialized services are perhaps economically feasible, the disabled may not accept them as alternatives to a revamped public-transportation system which accommodates their needs.

Among the most promising of specific innovative transportation models for the disabled are demand-responsive systems.

Demand-Responsive Transportation Systems

In 1970 the United States Department of Transportation estimated the total United States population of elderly and handicapped persons to be 26.5 million. In response to an apparently widespread need, some recently developed transportation systems in a few areas of the country attempt to better provide service for the disabled. These innovative transportation systems benefit the disabled population by (1) facilitating increased mobility, (2) allowing preservation of independence, dignity, and quality of life, and (3) providing access to medical service and recreation. One such system is a "demand-responsive transportation service." The basic operation of this service involves dispatching a vehicle in response to a patron's telephoned request while simultaneously accommodating in the vehicle other patrons with compatible destinations. Requests for service may be made just before the trip, or in cases of regular trips, in advance.

Elements needed for the operation of a demand-responsive service include (1) a fleet of vehicles, (2) a control and dispatch center, and (3) a means of communication between the patron, the control center, and the driver. These elements are required in both of the major forms of the demand-responsive service: a "route-deviation" form, in which the vehicle deviates from a fixed route to pick up or discharge passengers at requested locations, and a "pure demand" form, in which routing and scheduling of vehicles depend entirely upon the patrons' requests.

Pure-Demand Systems:

There are three variants of the pure-demand system. "Many-to-one," the first variant, provides transportation from several sites to a common destination such as a shopping center. "Many-to-few," the second, variant provides transportation from multiple origins to a few destinations, such as points on a downtown loop. "Lift-line," a two-year project being conducted by the Florida Department of Transportation and the United States Department of Health and Rehabilitation, is an example of the many-to-few variant. Lift-line provides a free fixed-route system linking low-income neighborhoods to social-welfare and medical facilities. The project provides operations on a weekday basis; it has 25 buses, each equipped with a two-way radio for dispatching operations. Operating costs for the first year averaged $1.39 per one-way passenger trip and $0.46 per vehicle mile (DOT, 1974).

"Many-to-many," the third variant, provides transportation between any origin-destination pair in the service area. Operating within a 3600-square-mile rural New Jersey area, Pioneer on Wheels, (POW), Inc. is an example of the many-to-many variant through its 36-vehicle service to elderly and handicapped persons. The service is divided into POW I (services for the elderly) which operates at $9,075 per month, and POW II (services for the handicapped) which operates at $14,000 per month. Although both POW I and

POW II are partially funded by state and federal funds, they are largely self-supported by contracts to provide for clients of agencies such as the Rehabilitation Commission and the Commission for the Blind (Pioneer on Wheels, Inc., 1975).

Private Industry Involvement in Transportation for the Disabled: Taxis:

The taxi industry is also seeking a role in federal programs for demand-responsive transportation as a many-to-many service. A 1970 survey estimating that taxis already carry 25 percent of all public transit passengers leads the taxi industry to believe its service would be beneficial if subsidized in carrying the disabled. Present federal support of the taxi-industry development of a special demand-responsive service is limited to specific rides for specific purposes (DHEW, 1975); however, in Arlington County a taxi-fare reduction program has been launched, under funding by the "Older Americans Act," which provides elderly users of Arlington taxi transportation with a flat fee of $0.15 per trip.

Preferred Systems:

Information collected at the transportation system center in Cambridge, Massachusetts indicates that the many-to-many variant of pure-demand service is the most prevalent and desired transportation model. A combination of the many-to-few variant used during peak hours and many-to-many used during off hours could maximize the efficiency of a pure demand-responsive transportation system.

Mass Transit Involvement in Transportation for the Disabled:

Because mass transit systems have the potential to reduce increasing expense of cars, consumption of petroleum, and environmental degradation, further development of mass transit would benefit the entire United States population as well as the elderly and handicapped. Figures for 1970 indicate that private automobiles consume 55 percent of the total transportation energy, while buses consume only 0.2 percent of that energy and get four times the per-passenger gas mileage that automobiles get. Development of mass transit systems for the entire United States would also reduce automobile-related environmental problems such as (1) air and water pollution caused by petroleum refineries, (2) solid-waste problems resulting in annual disposal of seven million junk cars and 200 million used tires, and (3) destruction of forests and wildlife caused by the five million vehicles that visit parks annually (Kasum, 1973).

Resources Required for Development of Demand-Responsive Transportation System:

A recent Department of Transportation survey reveals that typical van service would cost 50 to 70 cents per vehicle mile and about $1.20 to $1.40 per urban passenger trip of two to three miles. Rural costs would amount to 60 to 80 cents per vehicle mile and $3.50 to $7.50 per passenger trip. The cost difference results from varying market densities, differences in wage and fuel costs, service characteristics, and average trip lengths.

Technological development of a demand-responsive transit service for the entire United States population requires computer dispatching, automatic vehicle monitoring, automatic scheduling, fully dynamics routing, and advanced management analysis systems. However, prototypes are currently available for all of these elements (DOT, 1974). The remaining element required for implementing demand-responsive service for the disabled is a reduction of the physical and operational barriers cited by UMTA under "Major Travel Barriers Listed by Area of Impact." Special attention to these barriers might ensure wider use of accessible transportation systems by all United States Citizens.

HOUSING POLICY AND THE DISABLED

Housing for disabled persons is an area of increasing concern to policymakers, particularly with trends towards deinstitutionalization of the disabled population. Although housing is an area of great potential consequence for the disabled and for society, it has only recently begun to receive widespread attention.

RECENT DEVELOPMENTS IN POLICY RELATING TO HOUSING FOR THE DISABLED

The Housing and Community Development Act (HCDA), implemented by the Department of Housing and Urban Affairs and signed into law in 1974, contains the first provision in a federal statute for the development of alternative living arrangements for the disabled. However, because HCDA merely broadens housing opportunities by extending Federal benefits but does not specify that the needs of the disabled be met, advocacy by interest groups is necessary for disabled persons to use newly acquired housing benefits.

With the help of advocacy augmented by documentation showing that disabled persons are capable of residing in the community at large, disabled persons may begin to have the opportunity to choose between large institutions and alternative housing. Alternative-housing programs are based on the following assumptions.

1. Housing for the disabled should be as similar as possible to housing for the nondisabled.
2. Group housing should be conventional in appearance.
3. Size should be similar to that of other homes in the neighborhood.
4. Necessary supervision, guidance, and services should be available to disabled residents.
5. A wide variety of housing types providing easy access to the surrounding environment should be developed.

Although the disabled and elderly populations have been equally eligible for housing benefits since 1964, between 1964 and 1975 HUD-funded projects provided only 1,000 dwelling units for the disabled. By contrast, between 1957 and 1975, HUD-funded projects accounted for 700,000 units for the elderly. To offset this difference, in 1973, with the help of the United Cerebral Palsy Association, Senator Robert Dole of Kansas introduced the "Housing Opportunities for the Handicapped Act" to the Senate. At this same time, efforts in support of better housing by elderly citizens and the National Association for Retarded Citizens resulted in the introduction in the United States House of Representatives of the "1974 Housing Act for Older Americans and the Handicapped." Both bills, however, were rejected in favor of HDCA, which was passed with an amendment to provide research in alternative housing for the disabled.

The failure of Senator Dole's bill exemplifies that among national organizations at that time support for legislation concerned with housing needs of the disabled was minimal and fragmented, although congressional support of such legislation was bipartisan. In an attempt to overcome these difficulties, the 22 national organization members of the Consortium Concerned with the Developmentally Disabled (CCDD) established a task force on housing to influence implementation of HCDA.

Specific Provision of HCDA

Since its implementation, the main objective of HCDA has been the development of viable urban communities with decent housing for persons with low and moderate income. Therefore, HCDA has granted local governments much independence in setting priorities and controlling funds for housing programs and community development. Moreover, because the type of housing available is largely determined by financing and accompanying regulations, HCDA programs are very flexible.

Community Development Provisions:

The programs implemented by HCDA and funded by HUD have enlarged the potential of local governments to develop housing alternatives for the disabled. For instance, the Community Development (CD) program, although not a housing program, aids in the development of housing alternatives through the removal of physical barriers to mobility of the disabled and the acquisition and construction of neighborhood recreational facilities accessible to the disabled. Eighty percent of CD funds are allocated to metropolitan areas; however, before acquiring CD funds, local governments must guarantee citizen participation in planning and citizen awareness of proposed use of funds. In addition, according to HCDA requirements, every CD annual plan must accurately assess the condition of available housing and the needs of the disabled. Citizen participation and annual assessments are the main vehicles for targeting federal funds on housing needs of the disabled.

Congregate Housing Provisions:

HCDA also encourages development of congregate housing and rental assistance programs. Through HDCA, local governments are encouraaged by HUD to develop congregate housing facilities, defined as facilities in which not all units have kitchens and in which central dining areas are provided for the residents. Rental assistance is encouraged in Section 8 of HCDA, which authorizes HUD to pay owners of rental property the difference between contract rent and the portion of rent payable by low-income families. Individuals defined as disabled under the Social Security Act or the Developmental Disabilities Act or persons with long-term impairments are eligible for rent subsidies. These subsidies must not be less than 15 percent nor more than 25 percent of the family's gross income. Finally, payment must be consistent with the local Housing Assistance Plan (HAP) which usually comes under the supervision of the Local Housing Authority (LHA).

Housing Assistance Plans:

Housing Assistance Plans are required to include provisions for all of the following.

1. A complete survey of the housing conditions and needs of the disabled and other groups.
2. An annual goal for assisted housing development.
3. A list of priorities for meeting housing demands.
4. Identification of housing locations which provide support facilities for community development.
5. Citizen participation in the development of plans through public hearings.

Housing sponsors giving rental assistance may be exempted from these requirements if (1) applications are for new or renovated housing with 12 units or less, (2) housing is located in Federally assisted communities, or (3) housing is financed by state housing agencies.

Housing Development Provisions of HCDA:

At the time of this writing, allocations provided for in Section 8 of HCDA can be used for development of housing as well as for rental assistance. The allocations, under current guidelines, are distributed to each HUD area office where they become a "drawing account" against which local housing sponsors make application. Applications must be in compliance with the local HAP and exhibit well-substantiated requests for housing of disabled persons. Applicants for Section 8 funds have had three options for housing development: new construction, purchase of an existing structure, or lease of an existing building. The option chosen may affect eligibility for services or income standards established to qualify residents. These requirements emphasize the importance of local governments in directing community planning and development, and in coordinating efforts of housing development within operating budgets. Moreover, if federal housing assistance is curtailed in the near future, local governments must accept additional financial responsibility in order to maintain existing programs.

Construction Loan Provisions:

As revised by HCDA, HUD's Program 202 allows non-profit developers of housing projects for the elderly and handicapped to receive federal construction loans if they are participants in the Section-8 rent-subsidy program. Another requirement of the program is that all Program 202 projects be in support of and supported by the applicable State Developmental Disabilities Plan, although this requirement is currently ignored in HUD regulations. Program 202 loans awarded in 1977 are to be distributed to eligible sponsors by HUD area and regional offices. Awards in 1976 were distributed through the central office and favored the elderly population, with only 17 of the total 136 projects designed specifically for the disabled.

Start-Up Loan Provisions:

Start-up loans are another type of loan program implemented by HCDA. Section 106 (B) allows financing of early planning by nonprofit housing sponsors and public agencies. Section 106 (A) authorizes grants for technological development expenses for housing projects. Loans under this program are subject to HAP and LHA requirements and may cover up to 80 percent of preliminary costs such as surveys, analyses of the market, and architectural fees. An advantage of the program is that HUD charges no interest on the loans but advises sponsors to charge interest costs to their mortgages.

Similary, the Section 106 program authorizes grants for technical assistance to both public and private organizations. However, HUD has not yet funded Section 106 (A), and has implemented only limited funding of 106 (B).

HUD Mortgage Insurance Provisions:

HUD-insured mortgages on newly constructed and renovated housing are included in yet another program initiated by HCDA. This program insures 100 percent of the mortgage for nonprofit-housing sponsors and includes insurance provisions for profit-making sponsors as well. Although not subject to HAP requirements, HUD's insurance programs can be combined with Section-8 rent subsidies.

Funding for State Housing Agencies:

To increase funding for housing projects, HCDA encourages the formation of state housing agencies and authorizes HUD to guarantee financial activities of these agencies by covering up to 33-1/3 percent of their obligations. Although HUD has not yet implemented this program, state housing agencies would provide housing to low-and moderate-income families through bond-finance mechanisms which provide tax-exempt loans to home developers. An advantage of the program is that eligible agencies may receive up to 50 percent of the state's total Section-8 rent-subsidy allocation. Therefore, these agencies can provide construction funds for the development of housing programs for the disabled even when there is a scarcity of federal housing funds.

Provisions for Rural Housing:

HCDA also authorizes rural development of housing projects under the administration of the Farmer's Home Administration (FmHA) of the United States Department of Agriculture (USDA). The FmHA Rural Rental Housing (515) program authorizes loans to developers of rental housing projects in rural areas at a rate of 8-1/8 percent with a maximum 40-year payment plan. In addition, eligible persons residing in the 515 projects are paid rent subsidies through the FmHA 514 Rent Supplements program. Although no 515 projects have been specifically designed for the disabled, program regulations do not prohibit such development.

The Role of the Housing Assistance Council:

The HUD-funded Assistance Council assists housing developers in acquiring FmHA and HUD long-term financing and provides loans to sponsors until such financing is received. The Council is subsequently reimbursed when sponsors acquire long-term FmHA or HUD financing.

Demonstration Projects:

HCDA also authorizes HUD's development of demonstration projects, to determine the most effective housing designs, structures,and related facilities to meet the needs of the disabled and other groups. In addition, HUD maintains a special office to work with agencies interested in the development of specialized housing for the disabled.

Areas Not Covered by HCDA:

Although HCDA represents an advance in the development of housing programs for the disabled, comprehensiveness of the fact in relation to the disabled is limited in the following areas perceived as significant by advocates for the disabled.

1. There is no declaration of national policy related to housing for the disabled
2. There is no affirmation of the rights of the disabled to housing.
3. There are no mandated programs or guidelines, only enabling provisions, relating to housing for the disabled
4. There is no mention of the relationship between functional impairments and appropriate housing or of needed complementary services.

The fourth omission may reflect the inexperience of HUD officials in matching appropriate housing to specific disabilities. This inexperience, perhaps partly due to the reluctance of the organization to become involved in housing for the disabled, is reflected in the failure of many HUD-sponsored projects to satisfy the disabled. Some HUD-sponsored projects have been unappealing to disabled persons because of the stigma of being in such housing. Others have foundered because of the assumption within HUD that needs of the disabled and the elderly are analogous. For these reasons, successful housing for the disabled probably cannot be achieved solely by the use of HUD programs; rather, an agency with experience in housing as well as in service-delivery to the disabled is needed. A major problem in integrating housing with service-delivery is that these programs are under jurisdiction of separate Congressional committees, and states must cope with administering funds from different sources with differing requirements.

A combined housing and service-delivery agency would require a management program with a manager and staff skilled in fiscal and social goals, tenant management relations, and service-housing integration. HUD has proposed a 1978 requirement that managers of housing programs be trained in these skills, but the disability field has yet to develop management training related to housing.

Problems in Integration of Housing with Service-Delivery:

Further illustration of the lack of integration between housing and service-delivery is HUD's refusal to cooperate with the "Architectural Barriers Act of 1968." Although the act was intended to ensure disabled persons access to federally financed public buildings, HUD regulations for housing development apply only to residential structures specifically for the physically disabled. Also, HUD has not intervened in local-government proceedings to remove zoning ordinances prohibiting nonrelated individuals from living together, thus impeding development of congregate housing such as group homes or halfway houses.

Overall, HUD implementation of HCDA-initiated programs currently presents a series of obstacles which prohibit successful housing development for disabled persons. These obstacles should be removed if the effective and responsive housing projects provided for in HCDA are to be developed.

SPECIFIC POLICY-RELATED NEEDS AND PROGRAMS FOR ALTERNATIVE HOUSING

Legislation alone cannot ensure that housing needs of disabled persons will be met. Some of these needs have not been clearly enough defined, and alternatives have not been fully explored. Information on specific housing needs of disabled persons is only now beginning to be accumulated, and new housing alternatives are being investigated.

One of the major generalizations that have emerged from recent studies of housing needs of the disabled is that handicapped persons who need residential programming need more than a physical environment to which they can adapt. They also need social environment which maintains and optimizes their functioning levels through the provision of supervision, personal aides, and training.

ESTIMATES OF NEED FOR HOUSING AND RESIDENTIAL PROGRAMMING FOR THE HANDICAPPED

Estimating the number of handicapped persons who need housing and residential programming alternatives is difficult because many persons with disabilities are not so severely handicapped that they require special housing.

Among the disabled persons who can benefit from alternative housing programs are the approximately 10 million severely and "most severely" disabled persons of whom approximately 1.8 million are currently housed in institutional settings (The Urban Institute, 1975). Physically disabled persons make up a large percentage of this group, with approximately three million having mobility limitations which prevent their use of many buildings (Jeffrey, 1973). Accessible independent housing facilities which incorporate special features designed to compensate for limited mobility would fulfill a major need of this group (Fenton, 1972).

Another group whose needs for alternative housing programs are increasing includes the mildly and moderately retarded. The trend toward the use of community-based residential facilities for these persons is reducing the need for institutionalization (Rosen and Callan, 1973). Within this group, persons with intelligence quotients of 50 or less and those with multiple handicaps will probably need some form of sheltered living arrangement for most or all of their lives. However, many of these persons could benefit from less shelter than is provided in institutional settings (Eyman, *et al.*, 1972). The potential demand for community-based living arrangements among noninstitutionalized retardates is tremendous (Conley, 1973).

Mentally ill persons compose another group for whom alternative housing is increasingly in demand. Mental hospital populations are decreasing dramatically, particularly the elderly mental-hospital population (Santiestevan, 1975). One authority estimates that 30 to 40 percent of all mental patients currently hospitalized and most of the new clients entering the system can be cared for more effectively and less expensively in community-based residential settings (Rutman, 1976).

BENEFITS OF ALTERNATIVE HOUSING FOR DISABLED PERSONS

The two most significant benefits of alternative housing for disabled persons are increasing mobility and independence and decreasing negative consequences of institutionalization.

Architectural barriers in housing are the major hindrance to mobility to disabled persons. A 1975 study by the Urban Institute reveals that major mobility problems include getting in and out of residences, moving from room to room, and getting from the door to the street. Most subjects cite prohibitive costs as the reason such problems are uncorrected.

Overcoming the detrimental effects of long-term institutionalization has also been a major goal of alternative housing programs. These effects include sensory, motor, and social deprivation. Although large institutions are unlikely to disappear, institutional reform such as reduction in the number of residents, integration of services with the community, community-preparation programs for residents, and parental involvement may result in institutions serving only those in serious need of structured long-term placement (Scheerenberger, 1976).

POLICY IMPLEMENTATION PROBLEMS

Deinstitutionalization has been articulated as a national policy since Mr. Nixon's presidency and is also reflected in Developmental Disabilities legislation. However, the current legislative context of housing for the disabled is confusing and rapidly changing.

The Housing Act of 1964 is among the earliest legislation about housing for disabled persons. Under authority of this act, HUD requires that 10 percent of all units in housing projects designed for the elderly and funded or insured by HUD be accessible to the physically disabled (HUD, 1975). However, few of these units have been built (Ross, 1976), and those that have are unpopular with non-elderly disabled persons (Lauder, 1970).

A further difficulty with many public housing programs is that the American National Standards Institute (ANSI) standard is the criterion for judging accessibility. This standard lists minimal requirements for design of areas such as washrooms and doorways in all buildings used by the public. Many persons believe, however, that the ANSI standard is grossly inadequate in its present form because it specifies only minimal, not optimal standards (Kliment, 1975). The standard also lacks specificity in certain areas and does not explicitly cover residential housing (GAO, 1975). However, HUD has recently contracted for revision and expansion of the standard to include specifications for both single and multi-unit residential housing and mobile homes (Kliment, 1975).

The Architectural Barriers Act of 1968 is similarly criticized because it applies only to buildings constructed in whole or in part with federal funds and employs the ANSI standard as the criterion of compliance (Kliment, 1975). The effectiveness of the act is further reduced by the lack of an enforcement mechanism, although the Rehabilitation Act of 1973 is intended to correct this deficiency through creation of the Architectural and Transportation Barriers Compliance Board (GAO, 1975).

In addition to federal legislation, as of 1975, 49 states had statutory requirements that publicly-owned and privately-owned but publicly-used buildings and facilities be accessible to the handicapped (HUD, 1975). Also, some states are using tax credit incentives to encourage the development of barrier-free buildings and housing by private developers (Kliment, 1975). Local codes and ordinances governing everything from health and fire-safety to plumbing, however, determine the final structure and design of a building and sometimes interfere with uniform implementation of state and federally mandated housing policy (Kliment, 1975).

General Concepts in Housing Alternatives for Disabled Persons

Development of a full continuum of housing options is required not only to satisfy individual needs, preferences, and life styles, but to allow for change in disabling conditions. Most alternative housing programs are geared towards normalization (making available to the handicapped the same kinds of physical and social environments and experiences that are available to the nonhandicapped) and the least restrictuve alternatives (housing handicapped persons in the most normalized and least structured environment their capabilities permit). Alternatives range from slight modification of standard housing to design of special environments suited to the functioning of the handicapped (Jeffrey, 1973).

Housing and residential options for the disabled can be classified according to the following criteria.

1. Physical vs. Social Support--extent of relative emphasis on physical and social needs.
2. Low vs. High Structure--extent to which support (physical or social) is provided.
3. Integration vs. Segregation--extent to which the facility is integrated physically and the residents are integrated socially into the community.
4. Transitional vs. Long-Term--extent to which goal of facility is preparation for movement of individual to a more independent setting or provision of a stable and permanent residence.
5. Normalized vs. Nonnormalized--extent to which the alternative is physically and socially similar to residences of the mainstream culture.
6. Individual vs. Group--extent to which the living unit is congregate or based on a single-family concept.

In table 5-1, the most common housing alternatives are tentatively classified according to each of these criteria. Six of the most popular alternatives to institutionalization are barrier-free design, nursing homes, halfway houses, group homes, foster care, and independent living arrangements.

TABLE 5-1

LOCATION OF HOUSING AND RESIDENTIAL ALTERNATIVES ON CONCEPTUAL DIMENTIONS

Physical Support	BARRIER	NURSING INST	HWH FOSTER GROUP	Social Support
Low Structure	BARRIER	HWH FOSTER GROUP	NURSING INST	High Structure
Integration	ILA BARRIER FOSTER GROUP	HWH	NURSING INST	Segregation
Transitional	HWH	ILA FOSTER GROUP	NURSING BARRIER INST	Long-Term
Normalized	ILA BARRIER FOSTER GROUP	HWH	NURSING INST	Nonnormalized
Individual	BARRIER ILA	FOSTER GROUP	INST NURSING HWH	Group

Abbreviations Used:

INST = Institution
NURSING = Hursing Home
HWH = Halfway House
GROUP = Group Home

FOSTER = Foster or adoptive home
BARRIER = Barrier-free construction in housing*
ILA = Independent living arrangements and apartments

*In practice, barrier-free units within model HUD housing projects for the elderly and handicapped do not achieve the ideal with respect to integration in the community.

Barrier-Free Design:

Barrier-free design is geared to providng both accessible and adaptive housing for the disabled. Accessible housing incorporates minimal alterations, such as entrance ramps and wide doorways (Jeffrey, 1973). Adaptive housing deviates from traditional housing as necessitated by the resident's disability (Roos, 1974), incorporating such special features as adjustable counter tops or large bathrooms for the physically disabled or visual alarm systems for the hearing impaired (Michel, 1972). Barrier-free design, however, is still in the developmental stage in both public and private structures.

A study conducted in Iowa in 1974 to assess the extent of compliance with the Architectural Barriers Act of 1968 shows that nearly all buildings constructed since 1968 complied with some specifications, such as minimum door widths, but many lacked parking provisions for the handicapped (70 percent), level entranceways and walkways (20 percent), ANSI-specified stairways (nearly 25 percent), and accessible drinking fountains (over 33 percent). None had telephones equipped for persons with hearing impairments, and three fourths did not have visual alarm systems (The Easter Seal Society for Crippled Childred and Adults of Iowa, Inc., et al., 1974). Although HUD has developed barrier-free design specifications for public housing in general, these specifications apply only to facilities which are to be occupied by the handicapped or elderly, which have an elevator, and which consist of 25 or more units in a single structure (Fishman, 1971).

Nursing Homes:

Because of state decisions to be relieved of the expensive costs of long-term care for the mentally ill and mentally retarded, many of these individuals have been transferred to nursing homes. Nursing homes, which have traditionally housed the elderly, are also being used to care for the physically disabled (Reichert, 1975). However, because nursing homes are designed primarily to serve the elderly, they do not always provide suitable environments for younger handicapped persons. In addition, they often provide more care than is required, thus increasing dependency and cost (Fishman, 1971). Moreover, estimates are that 15 percent of the nursing home population does not require such institutional care (Noble, undated).

Halfway Houses:

The purpose of the halfway house is to provide an environment in which the former hospital or institutional resident can learn to participate in community life. Often halfway houses provide in-house rehabilitation services including re-socialization, education, recreation, vocational training, and psychological counseling. Others rely on community resources for such support services (Rutman, 1976). The number of halfway houses has increased rapidly in the United States during the past several years. An estimated 1200 to 1300 halfway houses now serve disabled persons.

Group Homes:

Group homes serve either as place of permanent residence or as transitional facilities intended to prepare residents for more independent lifestyles (Wolfsenberger, 1971). They are oriented more toward resident training than are foster homes, and are generally smaller and more family-like or normalized than are halfway houses. They have been used most often for developmentally disabled young adults. Resident houseparents and professional consultants provide support services. A recent survey shows that approximately half of these facilities are small (less than 10 residents), but that only 23 percent of residents of group homes are housed in small facilities (O'Connor, 1976). Most of the facilities are relatively new (75 percent having opened within five years of the study), and 69 percent are physically normalized. However, over half of residents of such facilities reside in nonnormalized facilities.

Foster Homes and Family Care:

Foster homes are beginning to be used for handicapped adults as well as for disabled and nondisabled children. However, finding sufficient numbers of reliable homes is difficult (Helsel, 1972). Foster homes have been shown to be effective alternatives to institutional care, provided that good social casework and adequate supportive and protective services are available (Helsel, 1972). Beneficial effects of foster care include increased functioning and arrested deterioration in functioning, and often decreased need for more restrictive care. At least 11 states have initiated family care programs for adults (RAPP, undated).

Independent Living Arrangements and Apartment Living:

Independent living arrangements and apartment-living programs are designed for individuals who are capable of relatively high levels of independent functioning, but who require some degree of supportive services or supervision. Apartment Living Training Programs for the mentally retarded (NARC, 1973) specify living arrangements which are made up of clusters of apartments with staff normally occupying one apartment or with one or two adult staff members living in an apartment with two or three disabled persons. A "maximum independence apartment" situation allows the individual to live alone or with roommates or a spouse, with supervision and assistance supplied by a visiting citizen advocate or social worker (Fritz, et al., 1971).

Independent Living Arrangements Programs for the severely physically handicapped, now in a demonstration phase of development, have shown benefits in terms of increased activities, and increased independence, education, and employment (Stock and Cole, 1975).

Other Models:

A promising housing alternative is the mobile home. The mobile home industry has just recently become aware of architectural barriers and supports state and federal legislation concerned with elimination of barriers. With proper design, mobile homes afford accessible housing at reasonable cost, a consideration which makes them especially suited for the disabled, who have traditionally earned low incomes.

Another model is the segregated village, a self-contained, commune-style environment which provides sheltered employment. This is not a popular concept, however, in view of the philosophy of normalization and integration in the community.

A quite different option includes offering services to families to permit them to keep their handicapped children in the homes (Skarnulis, personal communication). Support to families may include environmental modifications, subsidy of babysitting, and use of home trainers.

Cost of Specific Models

Almost all of the new alternative-housing programs represent substantial savings over institutional care.

Barrier-Free Design:

Barrier-free features included during construction add only slightly to the total cost of a building and insignificantly to the cost over the life of the structure. Cost estimates for barrier-free features range from 0.5 percent to 1 percent of overall costs (HUD, 1975). The greatest increase in total building costs occurs when specialized features and equipment (for example, elevators) must be included to accommodate the handicapped. The cost of making a house accessible for the wheelchair-bound is between 0.5

and 1 percent over the cost of nonaccessible housing (ATBCB, I, 1975). The cost for remodeling buildings ranges from 0.06 percent to 2.4 percent over the original construction costs (GAO, 1975).

The cost of nursing-home care often includes a profit for owners, and much of the financial support for nursing-home care comes from Medicaid funds. In one study in New York state, the average annual cost per resident for nursing-home care was $10,000, ranging from $22 to $70 per day.

Halfway houses cut down on residential care expenses by reducing the portion of residential costs attributable to hospital care. A National Institute of Mental Health publication, "The Cost of Mental Illness--1971," reports that hospital care costs account for about 40 percent of the costs of direct services to the mentally ill (NIMH, 1975). By contrast, residency in halfway houses appears to cost about half as much per day as does residency in state hospitals and a quarter as much as residence in psychiatric units in general hospitals (Glasscote, et al., 1971)

Group homes also offer substantial savings over institutional care, partly because of increased productivity of residents. Savings (in both economic and social resources) attributable to group homes can be as high as $8000 per mentally retarded person per year.

Foster-home placement also appears to be a cost-effective model, according to the Washington State Family Homes for Adults Demonstration Project (RAPP, undated) and the Commonwealth of Virginia (1973). Foster care was found to be less expensive than either prior living situations (mental hospitals and state schools) of residents or comparable alternate care. In the Commonwealth of Virginia study, foster care programs cost $1670 per year compared to $3440 per year for institutional care.

Independent living arrangements and apartment living also result in considerable savings over institutional care. The Cooperative Living Project described by Stock and Cole (1975) costs $530 per month, and a shared apartment with shared services costs $650 per month, in comparison to $734 per month for nursing-home care.

An apartment-living training unit is somewhat more expensive ($11.69 per day) than an independent living situation with out-of-house supervision ($9.95 per day) (NARC, 1973). In general, supervised apartment programs for the mentally ill cost from $3 to $8 per day (Goldmeir, 1975).

Although it is extremely difficult to compare cost figures for various housing and residential models, Rutman (1976) has compiled the following estimates for alternative housing for the mentally ill, shown in table 5-2.

TABLE 5-2
PER DIEM COSTS OF ALTERNATIVE HOUSING
FOR THE MENTALLY ILL

Option	Per Diem Cost per Person
State Hospital	$ 31
Skilled or Intermediate Care Nursing Home	$20-30
Halfway House	$12-18
Boarding Home	$ 7-15
Supervised Apartments	$ 3- 8

A major problem in the funding of residential care is the fragmentation of funding sources. Often facilities must put together complex packages of resources in order to cover costs. Therefore, Rutman (1976) recommends legislation to provide new sources of funding.

PROBLEM AREAS AND ISSUES

Regardless of the housing alternative, problems sometimes arise because of public attitudes, preferences of disabled persons, zoning barriers, gaps in community service-delivery systems, and monitoring and accountability.

Public Attitudes

A major obstacle to many community-based programs is the traditionally negative attitude of the public toward the disabled. Community opposition to programs for former mental patients is particularly strong (Rutman and Piasecke, 1976), although opposition to programs for the physically disabled is negligible. Regardless of public apprehension, however, community residential facilities have had no negative effects on property values and the character of neighborhoods, and neighbors have come to accept them.

Preference of Disabled Persons

Sometimes the disabled themselves oppose residential programs. For example, surveys of the disabled about their preferences in housing reveal that most disabled persons prefer a normalized environment and integration with the able population (Fishman, 1971). Few handicapped persons prefer to live in projects designed exclusively for the disabled or for the elderly and the disabled (Lauder, 1970). These preferences help to explain the marketability problems encountered with specialized units for the handicapped in housing projects for the elderly.

Zoning Barriers

Zoning ordinances constitute another very significant obstacle to establishment of community residential facilities for disabled persons, particularly in single-family residential zones. Family-care facilities (7 or fewer residents) allowed by zoning ordinances in only 40 percent of the cities studies in one report, and larger group-care facilities are excluded from single-family districts in over two thirds of the sample cities. Large group-care facilities are, however, permitted in commerical zones in more than 40 percent of the sample cities (Lauber and Bangs, 1974).

Gaps in Community Service-Delivery Systems

Even in residential programs which have become established, community services are not always compatible with them. Lack of services is not always the major problem. Often it is fragmentation in the organization of the service-delivery system. The compartmentalization of service-delivery according to type of disability and type of service provided often results in costly duplication of services and exclusion of many disabled persons from needed services.

Monitoring and Accountability

As housing alternatives multiply, so do problems in monitoring accountability. Varying licensing requirements and standards of quality, geographic dispersal of facilities and decentralization of administration, along with diffusion of responsibility when residential services are contracted for by states all contribute to monitoring and accountability problems. For example, facility may have to comply with conflicting state, county, and city requirements. Also, dispersal of community residences makes them less easy to monitor than large facilities, contracting for residential services by state governments also necessitates increased monitoring (Helsel, 1972).

All of these problems must be overcome before suitable housing alternatives for disabled persons become workable reality.

THE LARGER CONTEXTS OF REHABILITATION TECHNOLOGY AND POLICYMAKING

The political and economic factors which interrelate disability, rehabilitation technology, and policymaking provide a logical structure within which policymakers can consider the problem-solving effects of rehabilitation. They describe the larger context or "microenvironment" within which technology attempts to solve the problems of disabled members of society. However, they do not describe the entire realm within which policymaking and rehabilitation have consequences and impacts--many other factors from the larger environment of the whole of American society and culture. The social variables which affect--and are affected by--every person in the nation form a "macroenvironment" which interacts with the disabled, with rehabilitation, and with policymaking.

The macroenvironnment of rehabilitation policymaking has been, as shown above, extremely influential in the course of rehabilitation technology. Public policy covering disability and rehabilitation had origins in providing care for veterans disabled by a national war, and the "New Deal" extension of social services to provide security for some disabled persons had origins in national economic emergency. Manned spaceflight has contributed substantially to technologies which promise to solve problems of disability, but the economic curtailment of space exploration in an overall reassessment of national priorities may slow the development of these technologies considerably. Many significant factors within the nation, within states, and within local communities, although they may not be within the microenvironment of solving the problems of the disabled with technology, do directly interact with this problem-solving activity.

FACTORS IN THE REHABILITATION MACROENVIRONMENT

The application of rehabilitation technology to the problems caused by disability is a problem-solving activity which may be evaluated by various economic and social indicators. These indicators measure the overall capability of society in terms of societally produced goods and services, and they indicate the portion of the capability expended on social needs, including rehabilitation of the disabled.

The basic, overall capability which society has at its disposal to attempt new solutions to social problems is measurable in terms of the net national product, that is, the total dollar value of goods and services produced by the society exclusive of the dollar value of goods and services expended in production related activities. The net national product, however, is a measure of societal capability only in relation to the size of the society or the size of the workforce which is involved in production.

Table 5-3 shows the net national product (NNP) in relation to the gross national product (GNP) from the 1950 through 1975 in both current dollar values and in dollar values independent of inflation (1972 dollars).

Table 5-4 shows the projected net national product at plausible growth rates through the year 2025.

Table 5-5 shows the financial capability of society to solve problems. In constant dollar amounts, a figure for societal capability is obtained by dividing the net national product by the population of the United States over the years 1950 through 1975.

TABLE 5-3
THE GROSS NATIONAL PRODUCT (GNP) AND NET NATIONAL PRODUCT (NNP) IN CURRENT AND CONSTANT '72 $ (BILLIONS)

Year	GNP (Current)	GNP (1972 $)	NNP (Current)	NNP (1972 $)
1950	286.2	533.5	262.3	489.4
1955	399.3	654.8	364.0	597.7
1960	506.0	736.8	458.3	668.1
1965	688.1	925.9	630.6	848.7
1970	982.4	1,075.3	891.6	975.5
1975	1,499.0	1,186.4	1,346.4	1,068.6

TABLE 5-4
PROJECTIONS OF NET NATIONAL PRODUCT CONSTANT '72 $ (BILLIONS)

	Constant Rate of		
Year	3.35	4.5	Variable Rate of 3.14 to 1985 then 1.33 to 2025
1975	1,068.6	1,068.6	1,068.6
1980	1,259.9	1,331.7	1,297.2
1985	1,485.6	1,659.5	1,455.7
1990	1,751.8	2,068.0	1,555.1
2000	2,065.5	3,211.6	1,774.8
2005	2,871.6	4,002.2	1,896.0
2010	3,386.0	4,987.5	2,025.5
2015	3,992.4	6,215.4	2,163.8
2020	4,707.6	7,745.5	2,311.6
2025	5,550.6	9,652.8	2,469.4

TABLE 5-5
SOCIETY'S FINANCIAL CAPABILITY OF ADDRESSING PROBLEMS IN CONSTANT '72 $

Year	Billions NNP in '72 $	Thousands Total Population	$ Per Capita
1950	489.4	152.271	3,214
1955	597.7	165,931	3,602
1960	668.1	180,684	3,698
1965	848.7	194,592	4,368
1970	975.5	204,878	4,761
1975	1,068.6	213,631	5,002

Table 5-6 shows workforce production over the same years. Average production of individuals in the workforce is computed by dividing the net national product by the number of persons in the workforce during the various years.

TABLE 5-6
PER CAPITA PRODUCTION OF EMPLOYED WORKFORCE

Year	NNP in Billions	EWF in Thousands	Per Capita Production NNP/EWF
1950	489.4	60,570	8,079
1955	597.7	65,220	9,169
1960	669.1	68,290	9,783
1965	848.7	73,812	11,498
1970	975.5	81,815	11,923
1975	1,068.6	86,966	12,287

Some measure of the willingness of society to solve problems through the medium of government-formulated and administered policy is a function of resources acquired by and expended by governmental units. Table 5-7 shows the extent to which taxation and other charges have provided both national and state-and-local governmental units with resources for expenditure.

TABLE 5-7
TOTAL GOVERNMENT RECEIPTS '72 $ (BILLIONS)

Year	Receipts '72 $	Government Receipts as % of NNP
1950	128.7	26.3
1955	166.0	27.8
1960	203.4	30.4
1965	253.4	29.9
1970	331.1	33.9
1975	366.9	34.3

Receipts by sectors of the government are shown in table 5-8 both in constant-dollar expenditures and percentages of the net national product for both national and state-and-local governmental units.

Much that is measurable in the use of governmental problem-solving has to do with the willingness with which governmental spending is encouraged or tolerated by the population. The net national product, as an indication of the total resources which may possibly be provided to the government for problem-solving activity, can be compared to what actually is provided to the government by citizens through taxation, deficit spending, and national monetary-control measures. Table 5-9 indicates the societal "willingness for government to spend" for all programs for both Federal and state-and-local organizations.

TABLE 5-8
RECEIPTS BY SECTORS OF GOVERNMENT AND AS % OF NNP

Year	National Government Receipts '72 $	State and Local Receipts '72 $	NNP '72 $	National Government Receipts as % of NNP	State and Local Receipts as % of NNP
1950	93.8	39.7	489.4	19.1	8.1
1955	119.2	52.1	597.7	19.9	8.7
1960	140.1	72.7	668.1	21.0	10.9
1965	167.3	101.1	898.7	19.7	11.9
1970	210.2	197.6	975.5	21.5	15.1
1975	225.0	184.4	1,068.6	21.1	17.3

NOTE: Federal grants - in aid to state and local governments are reflected in receipts. Total government receipts as shown in table 5-7 has been adjusted to eliminate this duplication.

TABLE 5-9
GOVERNMENT SPENDING AS A PERCENT OF NNP IN CONSTANT '72 $

Year	Total Government Spending '72 $	NNP '72 $	% NNP Government Spending
1950	113.8	489.4	23.3
1955	160.9	597.7	26.9
1960	198.8	668.1	29.8
1965	252.8	848.7	29.8
1970	341.2	975.5	35.0
1975	416.8	1,068.6	39.0

TABLE 5-9 (CONTINUED)
GOVERNMENT SPENDING AS A PERCENT OF NNP IN CONSTANT '72 $

Year	Federal Government Spending '72 $	NNP '72 $	% NNP Government Spending
1950	76.1	489.4	15.6
1955	111.8	597.7	18.7
1960	135.7	668.1	20.3
1965	166.6	848.7	19.6
1970	233.9	975.5	22.9
1975	283.3	1,068.6	26.5

Year	State and Local Government Spending '72 $	NNP '72 $	% NNP Government Spending
1950	76.1	489.4	8.6
1955	54.0	597.7	9.0
1960	72.6	668.1	10.9
1965	101.1	848.7	11.9
1970	194.6	975.5	14.8
1975	176.5	1,068.6	16.5

NOTE: Federal grants - in aid to state and local governments are reflected in federal expenditures and state and local expenditures. Total government expenditures have been adjusted to eliminate this duplication.

Total national, state and local governmental spending is a product of spending in distinct areas including solving social problems, solving security problems, and solving other types of problems. Security problems, in general consist of the following.

- National defense
- International affairs
- General science
- Space and technology
- Natural resources
- Environment and energy
- Agriculture
- Commerce and transportation
- Law enforcement and justice
- Highways from state and local

Social problems include areas in the following list.

- Community and regional development
- Education, training, employment and social services
- Health
- Income security
- Veterans benefits and services
- Revenue sharing and general purpose fiscal assistance
- Education
- Public welfare

Other expenditures include general government, interest, and allowances.

Table 5-10 shows a breakdown of total government expenditures by classification of problems addressed as being either for social needs or for other needs wherein security and other needs are combined.

TABLE 5-10
GOVERNMENTAL OUTLAYS BY CLASS OF FUNCTIONS (BILLIONS '72 $)

Year	Government Spending for Social Needs	% of Total Government Spending	as % of NNP
1950	43.8	38.5	9.0
1955	53.5	33.3	9.0
1960	76.2	38.3	11.4
1965	103.9	41.1	12.2
1970	159.5	46.7	16.4
1975	227.4	54.6	21.3

Year	Government Spending for Other Needs	% of Total Government Spending	as % of NNP
1950	70.0	61.5	14.3
1955	107.4	66.7	18.0
1960	122.6	61.7	18.4
1965	148.9	58.9	17.5
1970	181.7	53.3	18.6
1975	189.4	45.4	17.7

OTHER MACROENVIRONMENTAL FACTORS

Many other factors within the whole of American society interact with rehabilitation technology and disability. An extensive list of the factors which have been useful in this assessment project appears in the *Related Data* Project Paper presented in volume IV of this report.

THE FUTURE CONTEXT OF REHABILITATION TECHNOLOGY: SCENARIOS

Scenarios develop alternative possible futures--to anticipate developments which are likely to occur and which are reasonable to expect. Scenarios are developed in order to illustrate the future, to stimulate thought about the future, and to provide an integrated background against which an understanding of the impacts and consequences of special issues or program thrusts can be determined.

ASSUMPTIONS ABOUT HUMAN REHABILITATION

In order to describe the future states of society for the assessment of long-range effects from various program thrusts applied to the problem of rehabilitation, the following general assumptions have been made concerning the function of human rehabilitation in the future.

1. Government-ensured egalitarianism, providing the disabled and other disadvantaged individuals with opportunity for "life, liberty, and the pursuit of happiness" approximately equal to that of nondisadvantaged individuals, will continue.
2. Government legislation in, funding for, and administration of social-welfare programs will continue to increase.
3. Refinement and sophistication of social-welfare programs, along with a greater proportion of government resources being devoted to social needs, will elicit an increasing demand for greater accountability by program administrators and participants.

4. Increased resources devoted to social-welfare programs must be obtained from either increased productivity or reallocation of public or private resources currently devoted to other types of programs.
5. Governmental expenditures will continue to be funded primarily through taxation.
6. The present goal of rehabilitation--to improve the social well being of the disabled by integrating them into society and, if possible, into the workforce--will continue, at least for the immediate future.
7. As technology develops, there will be improvement in rehabilitation techniques.

Basic Scenario Themes and Dimensions

Based upon past trends, present consideration, and emerging policies, three broad potential futures emerge within which the problem of human rehabilitation can be assessed. These are as follows:

Scenario Group I

MEDIAL: Moderate growth in funding for social needs; no limit on willingness to be taxed.

MEDIAL-C: Moderate growth in funding for social needs; constraints on willingness to be taxed.

Scenario Group II

UPPER: Increased growth in funding for social needs; no limit on willingness to be taxed.

UPPER-C: Accelerated growth in funding for social needs; constraints on willingness to be taxed.

Scenario Group III

LOWER: Reduced growth in funding for social needs; no limit on willingness to be taxed.

LOWER-C: Reduced growth in funding for social needs; constraints on willingness to be taxed.

These three scenario groups represent a continuum of alternatives from minimal to rapid growth as well as redistribution of funds among programs and a host of other conditions.

Scenario Group I

MEDIAL: Moderate growth in funding for social needs; no limit on the willingness to be taxed.

No major new funding for rehabilitation occurs though moderate growth occurs, programs initiated in the 1970's continue to be maintained, and some minor reallocations among programs are made.

The disabled population grows at a moderate rate (maintaining approximately the same percentage of total population) to about the year 2000. At this time, due to continuing research programs of the 1960's and 1970's, technological development for rehabilitation needs begins to have marked effect and the growth rate of the disabled population declines.

Because of increased technological development in support areas, by the year 2000 the moderately disabled and handicapped are being better assimilated into society. For example, new transportation systems become capable of handling the disabled; public buildings are designed or remodeled to permit the disabled to use them; industry has positive programs for their employment, etc.

American productivity increases at a moderate rate and the NNP grows at an average annual rate of 3.35 percent (a prediction from Energy, the Economy and Mass Transit, United States Congress, Office of Technology Assessment, 1975).

The population grows moderately at an average annual rate of 0.685 percent (a prediction based on Statistical Abstract of the United States, 1975).

The capability and the willingness of society to address its public needs grows moderately along with the economy.

Because of legislation in the 1960's and 1970's, a sizable amount of future tax funding is committed both for the natural growth of committed programs and for the retirement of debt. Thus, the tax rate rises at a moderate rate and this coupled with a continuing moderate inflation rate has the effect of lowering the standard of living or lifestyle.

Unemployment rates continue at approximately the 6 to 7 percent level. No major changes occur in work schedules; the work week remains much as it is today. The telecommunications industry contributes technology that permits some work to be performed in the home. More jobs are therefore available for the disabled persons, but at the same time they are competing for the work with the nondisabled.

The energy problems continue through the year 2025; thus any energy intensive program thrusts are not highly favored.

MEDIAL-C: Moderate growth in funding for social needs; constrained willingness to be taxed.

Under this scenario, all factors are as depicted above except that as the tax rate rises beyond a certain point society reacts by opposing any new or additional funds for governmental programs.

Scenario Group II

UPPER: Increased growth in funding for social needs; no limit on willingness to be taxed.

With an increasing growth of the economy, funding for social programs grows and this has the effect of increasing funds available for rehabilitation.

The disabled population grows at a moderate rate (maintaining approximately the same percentage of total population) to about the year 2000. At this time, due to continuing research programs of the 1960's and 1970's, as well as additional funding through the 1980's and 1990's, technological development in rehabilitation begins to have marked effect, and the effective disabled population begins to decline at a rate of about 0.7 percent per year. New funding for rehabilitation occurs, and the maintenance of funding trends of the 1970's and some major reallocations among programs occur.

Because of increased technological development in related areas, by the year 1994 the moderately disabled and handicapped are being better assimilated into society. For example, new transportation systems are capable of handling the disabled; public buildings are designed or remodeled to permit the disabled to use them; and industry has positive programs for employment of the disabled, etc.

American productivity increases; and the NNP grows at an average annual rate of 4.5 percent from now to 2025 (a prediction based on Technology Assessment of Portable Energy, RDT & P Center for Energy Studies, The University of Texas at Austin).

The population grows moderately at a annual rate of 0.630 percent until 1985. From 1985 to 2025 the annual rate is reduced to 0.3654 percent. From 2020 to 2025 the population declines by an annual rate of 0.236 percent (a prediction based on Statistical Abstract of the United States, 1975).

The capability and the willingness of society to address public needs increases along with the economy.

Due to legislation in the 1960's and 1970's, a sizable amount of future tax funding is committed both for the natural growth of programs committed and for the retirement of debt. The tax rate rises at a very moderate rate, because taxable income is increasing and a moderate inflation rate continues.

Unemployment rates continued at approximately the 4 to 5 percent level. Because of the relative prosperity of society and the desire for leisure time in larger amounts than provided by the two-day weekend, experimentation with different work scheduling procedures occurs. By the turn of the century, people are permitted to "bid" on work time; with the use of computers, individualized worker schedules are a reality. The basic 1920 working hours per year is maintained in certain areas, however, in many areas they reduce to 1500.

The telecommunications industry contributes technology that permits considerable work to be performed in the home. This makes more jobs available to the disabled population and many are gainfully employed because of the general prosperity and the increase in productivity taking place.

Service and information industries continue to grow as society continues to use more services. This trend also provides a greater job market for the disabled. Some programs of rehabilitation are required to permit the disabled to take advantage of this opportunity.

Due to increased programs of energy technology, the energy problem begins to subside around the turn of the century.

UPPER-C: Increased growth in funding for social needs; constrained willingness to be taxed.

Under this scenario all factors are as depicted above except that as the tax rate rises beyond a certain point society reacts by opposing any new or additional funds for governmental programs. Because of the prosperity and the increasing standard of living this threshold limit is somewhat higher than under Scenario Group I. Also, due to the prosperity, national debt has been decreased and governmental interest is reduced, thus permitting more funds for other programs. This has a beneficial effect on funds for rehabilitation.

Scenario Group III

LOWER: Reduced growth in funding for social needs; no limit on willingness to be taxed.

As the economy declines thus producing a decline in society's capability and willingness to address public problems, funds for social programs experience reduced growth. This has an effect on funds for rehabilitation; some programs initiated in the 1960's and 1970's experience curtailment.

The growth rate of the disabled population increases at a moderate rate, thus; the disabled population grows both in absolute and relative size. Because of reduction in research programs of the late 1970's and 1980's, technology development for rehabilitation is less effective, thus; the integration of the disabled population into the community is impeded.

Technological development in related areas is slowed, thus affecting the rate at which the moderately disabled and handicapped can be assimilated into society.

Due to legislation in the 1960's and 1970's, a sizable amount of future tax funding is committed both for the natural growth of programs committed and for the retirement of debt. Thus, the tax rate rises at an accelerated rate and this coupled with a continuing moderate inflation rate and reduced productivity has the effect of lowering the standard of living. Government funding programs are all subjected to review.

The United States experiences reduced productivity after 1985 and the NNP stabilizes to grow to an annual rate of only an estimated 1.33 percent.

The population growth rate is higher due to reduction in emphasis on population control and grows at an average annual rate of 1.125 percent (a prediction based on Statistical Abstract of the United States, 1975).

Unemployment rates rise to approximately the 9 to 11 percent level. Thus, social needs of unemployed persons increase. This factor affects the disabled and handicapped considerably: jobs for them are not readily available, and funds for rehabilitation programs are reduced.

LOWER-C: Reduced growth in funding for social needs; constrained willingness to be taxed.

Under this scenario all factors are as depicted above, except that as the tax rate rises above a certain point society reacts by opposing any new or additional funds for governmental programs. Because of the reduced standard of living, this threshold limit is somewhat lower than under Scenario Group I.

MAJOR EXOGENOUS VARIABLES WITHIN EACH SCENARIO

Each of the scenarios imposes certain limits on the macroenvironment of rehabilitation technology and disability. Within these limits, reliable analysis of the consequences of rehabilitation-technology related activities may be carried out.

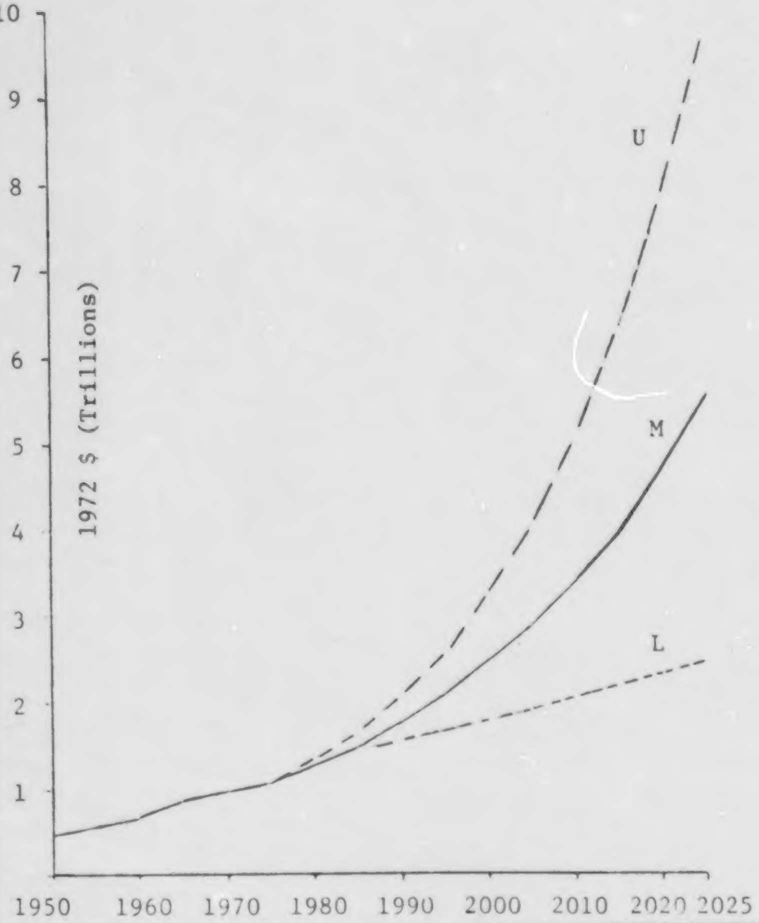
The net national product, a variable upon which capability depends, rises in accordance with the three scenarios as shown in figure 5-1. The total population, the second variable upon which capability depends, varies under the three scenarios as shown in figure 5-2.

Capability, the net national product divided by the total American population, rises correspondingly within each scenario group as shown in figure 5-3.

Willingness to be taxed, expressed in the ratio of government expenditure to the NNP, is projected within a range for each scenario group as shown in figure 5-4.

The effect of the three scenarios upon the size of the population of individuals is shown in figure 5-5.

These figures indicate broad aspects of the future contexts within which rehabilitation technology, disability, and American society will interact. The contexts form independent variables which may be selected in order to observe the logic of specific interactions between policy and technology. Such interactions are described in chapter 6 of this volume as the consequences, conclusions, and policy-related issues resulting from this study.



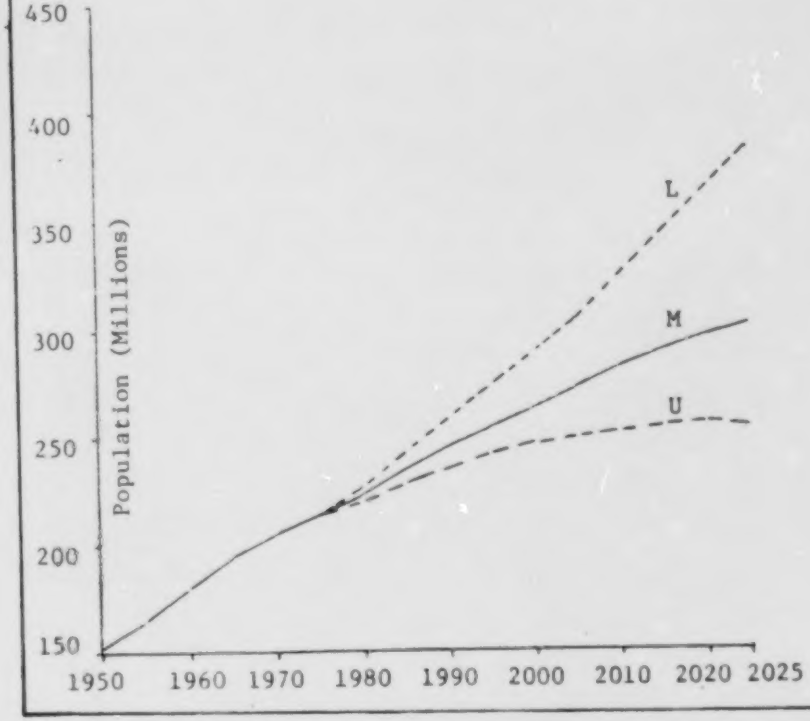
Note: Growth rates based on predictions made for GNP in "Energy, the Economy and Mass Transit," United States Congress, Office of Technology Assessment, 1975, and "Technology Assessment of Portable Energy RDT & P," Center for Energy Studies, The University of Texas at Austin, 1975. The low growth was arbitrarily selected in order to establish a lower boundary.

Projections of NNP in 1972 Dollars (Billion)

	M Constant 3.35% to 2025	U Constant 4.5% to 2025	L 3.14% to 1985 1.33% to 2025
1975	1,068.6	1,068,6	1,068.6
1980	1,259.9	1,331.7	1,247.2
1985	1,485.6	1,659.5	1,455.7
1990	1,751.8	2,068.0	1,555.1
1995	2,065.5	2,577.2	1,661.3
2000	2,435.4	3,211.6	1,774.8
2005	2,871.6	4,002.2	1,896.0
2010	3,386.0	4,987.5	2,025.5
2015	3,992.4	6,215.4	2,163.8
2020	4,707.6	7,745.5	2,311.6
2025	5,550.6	9,652.8	2,469.4

Figure 5-1. Net National Product (Projected in Constant '72 Dollars)

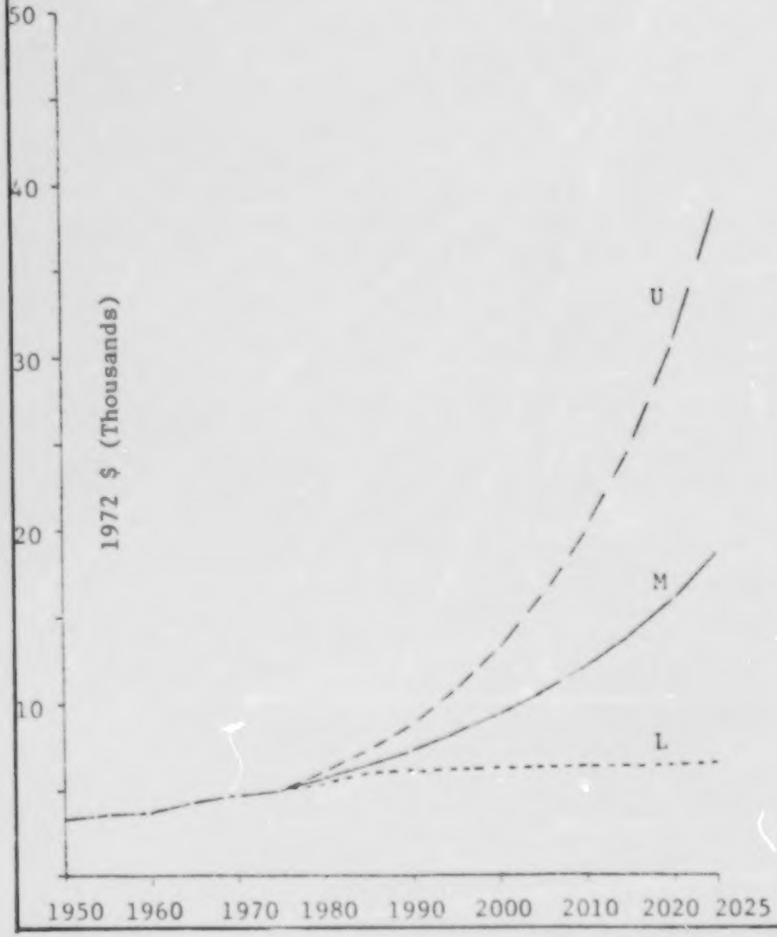
Note: Growth rates based on predictions made for GNP in "Energy, the Economy and Mass Transit," United States Congress, Office of Technology Assessment, 1975, and "Technology Assessment of Portable Energy RDT & P," Center for Energy Studies, The University of Texas at Austin, 1975. The low growth rate was a lower boundary.



Projections of Population
Various Average Growth
Rates (Millions)

Year	M .68%	U .33%	L 1.17%
1975	213.6	213.6	213.6
1980	222.8	220.4	225.7
1985	234.1	228.4	241.3
1990	245.6	235.6	257.7
1995	253.6	241.6	272.0
2000	262.5	245.1	287.0
2005	271.0	248.0	302.0
2010	280.0	251.0	322.0
2015	288.0	253.0	342.0
2020	295.0	255.0	362.0
2025	300.0	252.0	382.0

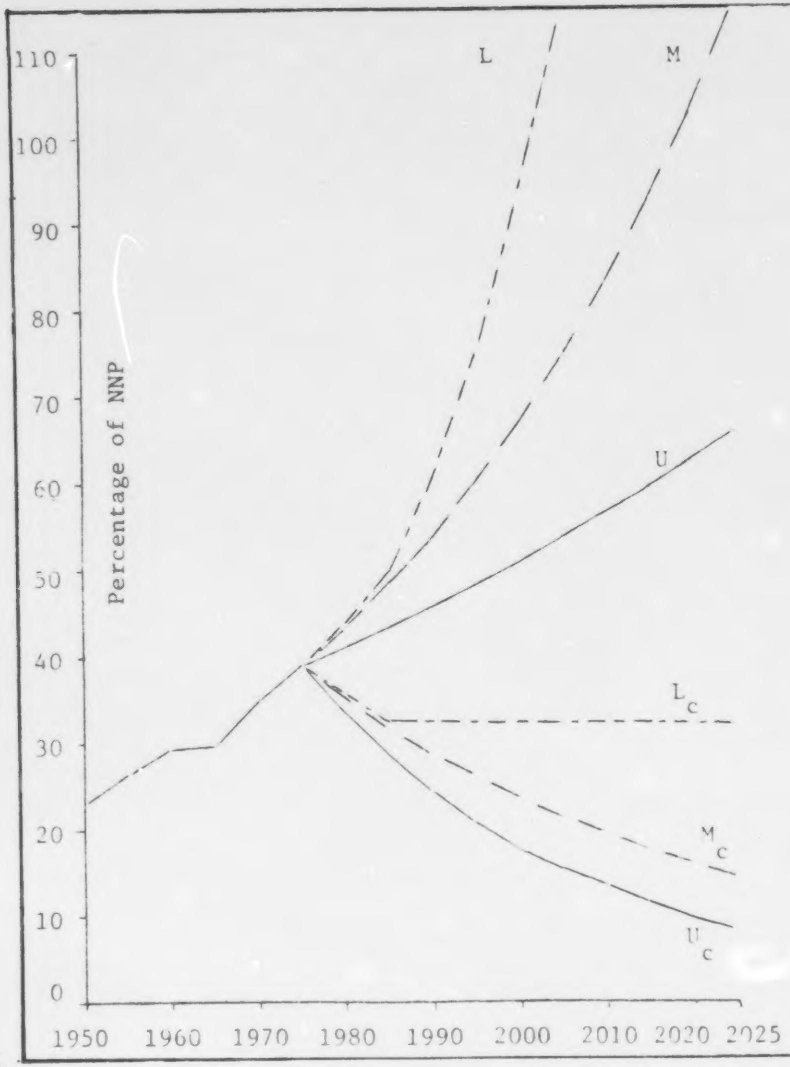
Figure 5-2. Total population



Note: Growth rates based on predictions made for GNP in "Energy, the Economy and Mass Transit," United States Congress, Office of Technology Assessment, 1975, and "Technology Assessment of Portable Energy RDT & P," Center for Energy Studies, the University of Texas at at Austin, 1975. The low growth rate was arbitrarily selected in order to establish a lower boundary.

	Projections of GNP/Projections of Pop		
Year	M M/M	U U/U	L L / L
1975	5,002	5,002	5,002
1980	5,655	6,042	5,526
1985	6,346	7,266	6,033
1990	7,133	8,778	6,035
1995	8,145	16,667	6,108
2000	9,278	13,103	6,184
2005	10,596	16,138	6,278
2010	12,093	19,871	6,290
2015	13,863	24,567	6,327
2020	15,958	30,375	6,386
2025	18,502	38,305	6,464

Figure 5-3. Society's Capability of Addressing Problems

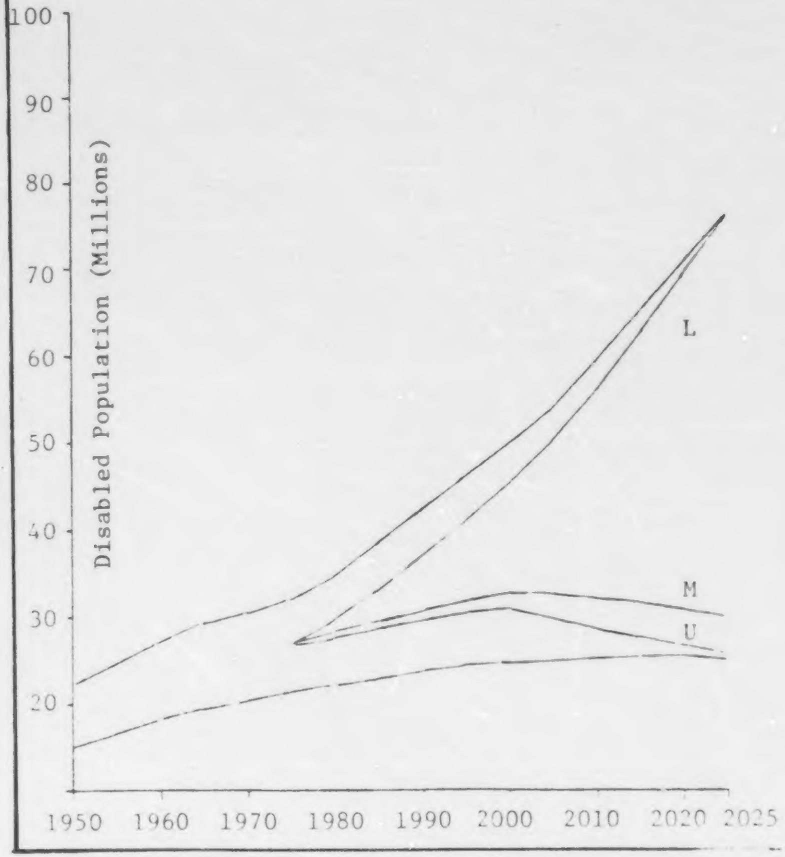


% Government Spending of Projected NNP's in Table-At Projected Average Annual Rates of

	5.6%		3.0%		1.3%	
Year	M NNP	U NNP	L NNP	M NNP	U NNP	L NNP
1975	39.00	39.00	39.00	39.00	39.00	39.00
1980	43.44	41.10	43.88	35.29	33.39	35.65
1985	48.38	43.30	49.37	31.93	28.58	32.58
1990	53.88	45.64	60.69	28.88	24.48	32.53
1995	60.02	48.11	74.63	26.13	20.94	32.48
2000	66.83	50.68	91.70	23.64	17.83	32.43
2005	74.43	53.40	112.72	21.39	15.34	32.39
2010	82.89	56.27	138.56	19.34	13.13	32.34
2015	92.31	59.29	173.32	17.50	11.29	32.29
2020	102.80	62.48	209.36	15.83	9.62	32.24
2025	114.49	65.84	257.35	14.32	8.24	32.20

Note: From 1950-75 total government spending as a percent of net national product increased an average of 2.08 percent per year.

Figure 5-4. Range of Society's Willingness to be Taxed



	Estimated Boundaries		Disabled Population in Scenarios*					
	Lower	Upper	Medial		Upper		Lower	
Year	10% Pop U	15%-20% Pop L	% Pop**	#	% Pop***	#	% Pop****	#
1975	21.4	32.0	12.5	26.7	12.5	26.7	12.5	26.7
1980	22.0	34.8	12.5	28.5	12.5	27.6	13.5	29.6
1985	22.8	38.3	12.5	29.3	12.5	28.6	13.7	33.1
1990	23.6	42.1	12.5	30.7	12.5	29.5	14.4	37.1
1995	24.2	45.8	12.5	31.7	12.5	30.2	15.1	41.0
2000	24.5	49.7	12.5	32.8	12.5	30.6	15.8	45.4
2005	24.8	53.8	11.9	32.4	- .7	29.5	16.5	50.1
2010	25.1	59.1	11.4	32.0	- .7	28.5	17.4	55.9
2015	25.3	64.6	10.9	31.5	- .7	27.5	18.2	62.3
2020	25.5	70.3	10.5	30.8	- .7	26.6	19.1	69.1
2025	25.2	76.4	10.0	30.0	- .7	25.7	20.0	76.4

*Starting point in 1975 assumed 12.5% of total population as midpoint of the boundaries.

**The disabled population as a percentage of total population remains constant to year 2000 then the the disabled population reduces to 10% of the total population in 2025.

***The disabled population as a percentage of total population remains constant to year 2000 then the disabled population reduces at an annual rate of .7%

****The disabled population gradually increases to 20% of the total population by year 2025.

Figure 5-5. Disabled Population

CHAPTER 6
POLICY-RELATED CONSEQUENCES

The information base assembled during the project and presented previously in this volume details a number of the mechanisms at work in disability, in rehabilitation, and in American society as a whole. The information is not, however, systematic enough in form to permit reliable analysis of consequences resulting from developments in disabilities, rehabilitation, and society. Within this project, as within this chapter of the report, a consequence-analysis step must be taken to assemble the diverse information into a maximally simple logical whole which can be used for reliable and predictable results in policymaking. This consequence analysis consists of three major steps: (1) analysis of the information base by experts and interested persons and organizations in order to provide structured pictures of how rehabilitation technology interacts with other variables, (2) generalization of this analysis into a form that permits projection of events in rehabilitation technology and related variables over the period of the present until the year 2025, and (3) critical review of the project activities yielding analysis and generalization in order to permit statements of policymaking considerations that are clearly important.

The first step in the consequence analysis centers on the work of panels of experts and interested persons assembled into project "work sessions." These experts and interested persons participated in a consequence-analysis process which involved their participating in the following activities.

1. Individually familiarizing themselves with the information base, reviewing the information base for error or other inadequacy, and preparing for panel discussions of consequences to be expected from rehabilitation technologies.

2. Attending the work sessions and using the methodology developed for the work sessions to identify the consequences and policy-related issues (a) from the information base, (b) from their own knowledge and analyses, and (c) from panel-discussion dynamics.
3. Constructing a preliminary panel report which specified the consequences and policy issues identified.
4. Reviewing for accuracy and completeness a final work-session report prepared by the project team to detail consequences and issues in order to provide, as in Delphi techniques, the most accurate synthesis of panel information possible.

Specific details describing procedures and methods used by work-session participants are outlined in Project Paper Number 1 in volume IV and detailed in volume V of this report.

The subject matter examined by work-session panelists was limited in scope to that which could be considered during a meeting of practical length. Individual panel discussions were held to analyze information in each of the four areas of technology considered in the project: environmental change, physical intervention, training and counseling, and service delivery. Within each of the technologies, panelists examined one or more branching elements in the taxonomic tree for the technology. The examination considered higher levels of each tree as "program thrusts," viz. technologies which, when implemented, became the core subject matter of policy and impact consideration. Each level beneath a program thrust was considered to contain "strategies"--that is, mutually supportive or alternative ways of implementing the program thrust. Panel members were therefore not simply refining the taxonomic trees (although they in part did that), but they were also continually considering the relationship of policy to the various levels of technology.

The second consequence-analysis step was designed to generalize the technology-specific analysis of each panel into a comprehensive whole which could be used for better understanding of the many relationships among disability, rehabilitation technology, society, and policymaking. Among the participants in each panel was a person who was charged with constructing a causal model--roughly a network of variables, influences, impacts, and consequences--of the logic and interaction of rehabilitation-oriented elements in society. The modeler presented (for the group's advice and consent), a "big picture" or "whole picture" of the numerous variables associated with one of the program thrusts of each of the four technologies, and when the causal model was as comprehensive and "correct" as practical, the modeler prepared a geometric simulation for computer-aided analysis driven by scenario-based variables. Each simulation was run from the year 1950 through the year 2025. The plotted results depicted graphically the behavioral implications within each causal model. After the work session was finished, the modelers generalized the information from their analyses of indivvidual categories of technologies into a set of variable factors extending throughout the entire area of rehabilitation technology in order to derive a perspective on the dynamic consequences associated with rehabilitation. The generalized model provides an integrated set of variable dynamics upon which policymaking considerations may be based.

The third consequence-analysis step consisted of careful review of results from both panel members and modelers by project-team members, members of the oversight committee, and reviewers selected from among experts and interested persons independent of the project. During this review, each consequence was examined in relation to the dynamic whole established by the work-session panel activities and reviews. The overall logic of interrelated variables in disability, rehabilitation technology, and society were examined and reexamined to ensure the completeness of identified consequences and policy effects and the overall "robustness" of the description of rehabilitation in relation to its ultimate utility to policymakers.

WORK SESSION RESULTS

Work-session results describe the consequences of implementation of specific program thrusts. These results are summarized below and are reported in more detail in appendix C. A complete account of work-session activities, results, and conclusions is given in a volume supplemental to this report, volume V, containing the Work-Session Report.

The general objective of work-session activities was to identify through expertise, judgment, and the data base compiled earlier in the project some specific consequences and consequence-generating mechanisms or patterns associated with rehabilitation. These consequences and patterns, in turn, were later used by team members to explore the other program thrusts in the taxonomies of technologies.

The first step in team analysis involved isolation of the mechanisms particular to program thrusts within each category of technology. The results of this step are summarized in this chapter. The details of each program thrust are found in appendix C.

REHABILITATION TECHNOLOGIES CONSEQUENCES RESULTS

MAJOR CONSEQUENCES OF ENVIRONMENTAL CHANGE PROGRAM THRUSTS

Environmental change technology may visibly change facilities, or change the esthetic appearance of facilities. When these changes are made, negative public reaction from those not directly benefitted can be expected. These technologies may also improve facilities for persons with certain disabilities while they simultaneously limit facilities serving persons with other disabilities--as when removal of curbs aids wheelchair-bound disabled and hinders visually-impaired disabled.

Environmental-change technology to increase mobility of the disabled may also expose them to hazards not encountered when mobility was impaired. For example, increased employment of the disabled in non-sheltered workshops increases the risk to the disabled of injury. Employers, public-works agencies, and other administrative units can be expected to incur increased costs in providing safety measures which reduce the risk of injury among disabled to a level comparable to the risk of injury among the general population. Overall, increased costs to industry will be likely because of increased mobility made possible by environmental change. Therefore, additional professional supervision may be required in workplaces where disabled persons are employed.

Within adjunct areas of the marketplace, both rehabilitation and labor agencies may react to environmental-change-induced mobility increases. Increases in the number of professional and paraprofessional personnel are to be expected to provide vocational training and job-placement service. Labor unions may be strained, especially during periods of high unemployment, by the increase in the labor force caused by greater mobility among disabled persons.

The spectrum of persons and organizations affected by environmental-change program thrusts includes disabled persons, the general public, policymakers, neighbors of the disabled, users of public-transportation systems, transportation-system personnel, construction-industry personnel, the Department of Labor, labor unions, families with disabled persons, and taxpayers.

Results bearing on policymaking include a probable reluctance by private industry to support such programs in the absence of governmentally provided incentive and regulation. Economic incentives and statutory regulations must therefore be included in any policymaking attempt to stimulate environmental change.

MAJOR CONSEQUENCES OF PHYSICAL INTERVENTION PROGRAM THRUSTS

The physical intervention work-session panel considered two program thrusts--physical therapeutic agents (PTA) and rehabilitation devices (RD).

The target population for the program thrust of physical therapeutic agents includes all those disabled experiencing one or more biological dysfunctions. Thus, this program thrust incorporates some form of biological change as therapy to improve the communication life function for the behavior, motor, and sensory impaired. The cognitive-intellectual life function is expected to be enhanced for those persons with behavioral impairments. The health life function may be expected to improve primarily for persons with chronic diseases and only secondarily, if at all, for persons with other biological dysfunctions, e.g, sensory impairments.

The target population for the program thrust of rehabilitation devices includes those disabled who will be helped by adaptive equipment, sensory aids, and prosthetic or orthodic devices. Thus, this programs thrust centers on providing what could be termed appendages for the disabled.

The greatest effects can be expected within the mobility life function which includes normal ability and behavior in mobility, use of manual skills, locomotion in living and working environments, and movement from place to place. Improvement in this area should, in turn, positively affect the social attitudinal life functions. Those disabled who can be expected to receive the greatest benefits in mobility and social-attitudinal life functions will be those with motor disorders followed by those with sensory disabilities. Persons with chronic diseases will experience moderate improvement in both mobility and social-attitudinal life functions, while persons with behavioral disorders will experience only slight improvements.

The other three life functions: health, cognitive intellectual, and communications will be affected to varing degrees within the various different disability categories. Within some specific disability categories, these life functions will not be affected by this program thrust, e.g., the health life function for the sensory impairments, the cognitive-intellectual life function for the chronic diseases, or the communication life function for the behavioral disorders.

Besides the target populations of these two program thrusts, the general population, the technological community, and the families of the disabled will experience near-intermediate and long-term effect. The technological community will be called upon to develop, produce, and distribute these technologies. The families of disabled individuals should have fewer demands for rehabilitation services in that once rehabilitated, the former disabled should be able to undertake a larger share of family activities. The general population should benefit from this type of rehabilitation in that there would be one fewer net consumer and hopefully one more net producer.

Some potentially adverse effects may be associated with physical intervention, particularly within the rehabilitation device program thrust, with the more visible and obvious prosthetic and orthodic devices and sensory aids. For although these individuals may be fully integrated into the community and into the workforce, they may be viewed not only by others but by themselves as not normal. These adverse effects may be accentuated if rehabilitation is anything less than complete capability to do whatever the nondisabled can do, even if one may choose not to engage in those activities. The lack of choice may be just as damaging to the overall view of quality of life as was the disability itself. This perceived lack may very well lead to increased demands to accomplish this "last 2 percent," to get to full capability including freedom of choice, thus resulting in ever-increasing demands for goods and services. This situation may arise even if the majority of the disabled target population view the rehabilitation as increasing the quality of life. The laws pertaining to the target population will apply to all members of the disabled population. Therefore, unless the majority eligible for increased goods and services choose not to avail themselves of something "rightfully" theirs by law, the cost burden to society brought on by the few will be multiplied.

The general population may receive some benefits through the introduction of various forms of adaptive equipment, especially if this equipment can also be used by nondisabled persons to more easily perform specific activities.

If physical intervention results in a net gain to society in numbers of producers, the benefits may offset the net costs to society of meeting the needs of non-productive consumers.

MAJOR CONSEQUENCES OF TRAINING AND COUNSELING

Two program thrusts, preschool academic education (PAE) and vocational education (VE), were dealt with in the training and counseling work session. The target group or population associated with "PAE" is made up of preschool disabled children. This group includes approximately 7 percent, or 1 million, of all children under 5 years of age. The target population for "VE" is an estimated 5.2 million disabled students who will be enrolled by 1980.

According to the life-function analysis in the work session, improvement in PAE would contribute to improvement in all life functions. The greatest improvements can be expected in the health and social-attitudinal life functions of both children and their parents. The improvement would be reflected in the enhancement of the children's self concepts and in improvement in cognitive-intellectual functioning, which would come from early stimulation of the children's cognitive responses and from early focus on cognitive-intellectual development for children with sensory impairment. Also, PAE programs can be expected to improve communication for both the mentally retarded and the sensory impaired. Also, some incremental increases in bodily mobility and geographic mobility may be expected. All of these life-function improvements for children can be expected to reduce overall levels of stress on parents of disabled children.

Near-term consequences of the PAE program thrust would be rather immediate improvements in functions performed by disabled children. Costs for these improvements would surface quickly. It is estimated that PAE would cost $1000 per child per year (or 1 billion per year total system cost).

Intermediate and long-term consequences include (1) reduced need for institutions for the disabled, (2) decreased size of the disabled population, (3) improvement in life functions for living and unborn siblings of disabled children, and (4) increased magnitude and success of special education programs.

Information generated in the "VE" discussions was tied to the assumptions that (1) greater numbers of disabled individuals would enter school as a result of a preschool program for the disabled and (2) more disabled students would be retained in regular classrooms and schools once they were enrolled.

Life-function analysis generated in the session generally indicated beneficial changes in all life functions. Social-attitudinal functioning would undergo the most significant improvement. Important gains also could be expected in cognitive-intellectual functioning and communication. Moreover, the communication functioning of disabled students with speech and hearing problems could be expected to significantly improve. Finally, slight to moderate improvement in mobility and health could be expected.

Because of the nature of the target group, school age children, the impact of VE is and will continue to be somewhat deferred. Those now receiving vocational training will not enter the job market immediately. Generally, however, the following intermediate and long-range consequences can be expected. (1) Nondisabled workers may eventually face increased competition for jobs. (2) Additional jobs for professionals in training and counseling would be created. (3) Schools would have to be architecturally modified, and special tools would have to be developed. (4) Public and private organizations, other than public schools, would be similarly affected. (5) Unions would have to resolve issues related to the acceptance of disabled workers into union ranks. (6) The family unit would be strengthened by the economic productivity of a disabled member.

Vocational education programs are now and are expected to continue to be cost effective. There is an anticipated increase in productivity potential as the employability of disabled persons improves. Finally, if many disabled are trained for blue-collar work, they may find a favorable job market because of a reduced societal interest in blue-collar positions.

In sum, the two program thrusts, PAE and VE, seem to offer significant increases in cognitive-intellectual functions. These increases, in turn, translate into improvements in social-attitudinal functions. Overall, both thrusts demonstrate promising cost-benefit potential. Finally, both thrusts seem to be generally acceptable to the nondisabled population, in that one deals exclusively with small children and the other is presented as a more or less self-sustaining program aimed at employability.

MAJOR CONSEQUENCES OF SERVICE DELIVERY PROGRAM THRUSTS

Because of the widely dispersed nature of service-delivery systems and the scarcity of data relative to management and resource requirements, the work-session panel dealing with service delivery focused on the content of service delivery.

The target population includes the entire disabled population without regard to whether they are now or have been served. Panelists felt that current approaches to service delivery had not fully explored the utility of advocacy and chose this as the program thrust to be explored.

Service delivery involves both direct services and indirect services. Among direct services are training and counseling, physical intervention, and environmental change. Indirect services include financial transfer, regulation, information, and advocacy. Direct services focus on rehabilitation needs, while indirect services focus on maintenance needs. Advocacy falls within the scope of maintenance.

Advocacy can be expected to have some near-term effects on all life functions. Mobility, social-attitudinal, and communication life functions are likely to be improved through legal advocacy. System or case advocacy will tend to produce long-term improvements in health and communication life functions. Some near-term adverse effects on social-attitudinal functioning of certain disabled groups may occur that will dissipate in the long-term.

The general population, the technological community, and families of the disabled will experience near-term effects from advocacy, while long-term, cumulative effects are expected through increased communication, interaction, and involvement with disabled persons. The general population will experience an additional financial burden. The technological community will accumulate benefits from the increased demand for its services. The disabled person will experience increased personal autonomy and can better function as a sustaining element within a family. Families will accumulate the long-term benefits of being raised above the poverty level.

The consequences flowing from advocacy depend upon the capacity of advocacy to produce changes in organizations and procedures and upon the capacity of advocacy to maintain an up-to-date review of both direct and indirect service-delivery systems. Considering these factors, the following consequences are likely to occur.

1. Major policy reforms may be required in the long-term to deliver the direct and indirect services required by disabled persons.
2. A significant portion of the institutionalized disabled population may be deinstitutionalized in the long-term.
3. The disabled population through advocacy may be more visible in the near-term, resulting in near-term adverse reactions from the general population. These reactions may or may not dissipate in the long-term.
4. Transfer payments may reduce the long-term need for organized delivery of direct services.
5. In general, life functions will accumulate long-term benefits from advocacy.

LIFE-FUNCTION CONSEQUENCES RESULTS

Analysis performed subsequent to the work-session conference by members of the project team included in depth examination of the data compiled to determine relationships between the life-function areas and technology groups. The relationship of application of each technology to each life-function category is shown in table 6-1.

TABLE 6-1
REHABILITATION TECHNOLOGIES APPLIED TO LIFE FUNCTIONS

	Health	Mobility	Communication	Social/Attitudinal	Cognitive/Intellectual
Environmental Change	5%	50%	9%	36%	0%
Training & Counseling	19%	11%	18%	36%	16%
Physical Intervention	41%	26%	24%	7%	2%

The greatest impact of environmental change is on mobility; it has a weaker but significant impact on social-attitudinal functioning. Training and counseling has the greatest impact on social-attitudinal functioning, with other impacts distributed evenly through the other four life-function categories. Physical intervention has the greatest impact on health, with lesser but significant and approximately equal impact on mobility and communication. Service-delivery technology, not represented in the table, was found to have a magnifying or amplifying effect of equal magnitude for each technology and life function.

Evaluating the effectiveness of all categories of rehabilitation technologies in solving problems associated with disability required the formation of comprehensive pictures of improvements in each of the five life-function areas.

CONSEQUENCES OF IMPROVED MOBILITY

Improvement in mobility produces slight improvement in the four other areas of life functioning. Improved mobility causes increased demand for a large group of services, including accessible transportation, education, and employment-related services. Improved mobility also increases the access of disabled persons to jobs, and it increases employment, visability, and family status of disabled persons.

More remote consequences of increased mobility include increases in productive activities among disabled persons, diminished dependence on supplemental income by disabled persons, and changes in public attitudes toward disabled persons. Competition for jobs increases and may cause a decrease in employment of the nondisabled. Increased political lobbying power of the disabled may decrease the institutionalization of the disabled. New safety and emergency measures must be enacted by public and private sources to provide adequate levels of protection for the disabled. As the number of immobilized disabled persons decreases, new patterns of mobility develop in which the disabled find themselves less dependent on others. Family members, relatives, and acquaintances of disabled persons will experience effects of lessened dependence.

CONSEQUENCES OF IMPROVED HEALTH

Improvement in health produces differential impacts on the other life functions. The nature of the impact is conditioned by the seriousness and character of the disability. For example, those who suffer from chronic illness, but who otherwise operate within the normal range of communication and cognitive-intellectual functions may, with relief from the chronic illness, experience increases in mobility, and social-attitudinal functions may translate into increased amenability to train and counseling program thrusts. The ultimate consequences of improvement in the health life function may be increased employability, productivity and additional improvement in social-attitudinal functioning.

On the other extreme, persons who are nonambulatory and who experience improved health but remain nonambulatory are not likely to experience significant increases in mobility or social-attitudinal functions. Moreover, many of these individuals are not likely to benefit from educational thrusts, in that they would not experience commensurate levels of employability.

In the middle range, ambulatory persons with adequate cognitive-intellectual functioning and significant, but accommodatable physical limitations, who experience improvements in health may, to the extent that they are trainable and employable, require extraordinary assistance on the job. The assistance may take the form of increased safety measures and possible provision for rehabilitation therapists, counselors, and educators at the worksite.

Persons with inadequate cognitive-intellectual functioning who would experience increased mobility with improved health are not likely to experience improved employability, nor would they experience appreciable increases in communication. They might, however, experience some improvement in social-attitudinal functioning. In addition, improvement in health might be enough to put some of these individuals over the minimally educable threshold and qualify them for some type of sheltered workshop activity.

Ultimately, whatever the nature of the individual's disability, improved health should reduce the psychological strain on other family members.

CONSEQUENCES OF IMPROVED SOCIAL/ ATTITUDINAL

Enhancement of social-attitudinal functions has been treated throughout this report primarily as a dependent variable. Generally, improvements in other life functions tend to generate improved social-attitudinal functioning. However, other areas are also influenced by changes in social-attitudinal functioning.

Improvement in social-attitudinal functioning, such as improved self concept brought about by changes in mobility, proxemics, training, or health may eventually be translated into additional demands on programs and funding. Improvements in self concept are undoubtedly important and productive changes in the lives of disabled individuals. These individual improvements often are reflected in increased participation in the society. Not all of the new participants, however, will be able to finance their own participation. As a result increased intermediate to long-term expenditures may be necessary to maintain an individual at his or her increased level of participation. The issue implied in this relationship between increased function and increased societal cost is not so much one of whether the individual should be helped to achieve self actualization, but whether there is, in aggregate terms, additional tax willingness to finance the programs.

Many of the less seriously disabled, however, will achieve increased social-attitudinal functioning, increased employability, and increased participation in society. These disabled persons will, as an overall consequence, become financially autonomous. For the less seriously disabled, who are the most culturally acceptable, improved social-attitudinal functioning can be expected to generate circumstances which continue to improve their range of life-function effectiveness.

Increased economic strength would gradually increase the tendency for disabled advocacy groups to participate in mainstream policy input processes, and the ultimate result would be the enhancement of access for the disabled to policymaking.

CONSEQUENCES OF IMPROVED COGNITIVE/INTELLECTUAL

The cognitive-intellectual life function is the area in which the fewest needs and need constellations are reported. This life function includes normal ability and behavior in intelligently manipulating symbols and objects. This life function has two basic components: skill and understanding.

The principal rehabilitation technology used to correct cognitive-intellectual dysfunction is training and couseling. Physical intervention is used, but far less extensively. The development of the skill component of cognitive-intellectual life function will be reflected in other life functions. Improvements in cognitive-intellectual skill will be positively reflected in the communication life function, and early intervention in cognitive-intellectual development may be especially effective for some specific disabilities (e.g., mental retardation).

Program thrusts designed to enhance a disabled person's cognitive-intellectual life function may be expected to have positive near-term effects as in the benefits of vocational training in schools. For individuals with secondary work disability and occupational disability, this training may also have beneficial effects in the near-term and the long-term. Program thrusts of this type may not be as beneficial to the severely disabled because of more pronounced biological dysfunctions in the members of this group. Additionally, many members of this group do not experience cognitive-intellectual dysfunction.

The long-term consequences of program thrusts designed to enhance the cognitive-intellectual life function are to some extent variable. While the near-term beneficial effects are likely to continue through the long-term, the increased understanding that accompanies improved cognitive-intellectual functioning brings increased awareness of both the disabled person's condition, and the person's potential for improved life function. The improved understanding may result in unrealized expectations that lead to detrimental effects on the social-attitudinal life function.

The quality of life perceived by the person with a cognitive-intellectual disability is to some extent relative to the person's level of understanding. Thus as cognitive-intellectual understanding is enhanced, it may be necessary to augment other life functions such as mobility and communication to maintain the short-term benefits through the long-term.

CONSEQUENCES OF IMPROVED COMMUNICATION

Improvement in the communication life function centers primarily on those persons with impaired sensory or communication capacity and persons whose communication content is deviant as a result of mental disorders.

Primary improvement in the communication life function will result from physical-intervention, and training and counseling program thrusts. Secondary improvements will result from environmental-change program thrusts.

Improvement in the communication life function will have the greatest consequences for the sensory impaired. The improvement will directly affect their mobility because they will now be able to receive sensory input from the environment. Persons with difficulty in sending messages will be affected to a lesser degree but with a correspondingly greater improvement in social-attitudinal life-functioning, as their ability to relate to other persons improves. Cognitive-intellectual life functioning will be enhanced through decreased difficulty in acquiring new skills. Health will be indirectly improved through improved capacity to communicate health needs.

Improvement in communication life functioning will affect every aspect of a disabled person's functioning. Decreased ability to receive or send messages is a primary obstacle to learning, employment, social interaction, and participation in society. Improvement in the communication life function directly improves the disabled person's ability to cope with the environment as well as with other disabilities he may suffer, and it greatly improves his ability to function autonomously.

GENERALIZED RESULTS

Work-session and life-function consequence analyses formed the basis for a generalized description (without respect to specific technologies and life functions) of the systematic patterns involved in rehabilitation. This step of the assessment formed the initial step in the design of a generalized computer-implemented model of the relationships among consequence-determining variables identified in rehabilitation.

AFFECTED INDIVIDUALS, GROUPS, AND ORGANIZATIONS

The individuals, groups, and organizations affected by rehabilitation programs are broadly viewed as belonging to one or more of the categories shown in figure 6-1.

Disabled Population
Families of the Disabled
Organizations
Nondisabled Population
Technological Community
Government

Figure 6-1. Categories of affected individuals, groups, and organizations

Within these broad categories, some individuals, groups, and organizations are directly affected by rehabilitation programs. The disabled population is directly affected by improvement in one or more life functions, with the consequences stated earlier in this chapter. Others less directly affected are members of families of disabled persons. Still less directly affected are members of the nondisabled population who interact with the disabled population.

The analysis reveals that although rehabilitation programs exhibit a multitude of effects, only a subset of these acts directly upon the affected parties, and the remainder act through intermediaries to have indirect, although important effects.

Figure 6-2 illustrates a classification of affected individuals, groups, and organizations according to the directness of the effect of rehabilitation programs.

Group I is composed of disabled persons and persons with whom the disabled have close ties--persons ranging from immediate family to neighbors and peers. Neighbors become, for example, more aware of, understanding of, and sympathetic toward life-function impairment as disabled persons have greater participation in the community. Group II comprises individuals, groups, and organizations one level removed from the direct effects of a program thrust. In Group III are individuals, groups, and organizations two or more levels removed from the direct effects of rehabilitation programs.

Group I	Disabled - improvement in some L.F.(s) Family of the disabled Peers and neighbors Other minority groups Application personnel and technological community Rehabilitation organizations Charitable organizations Government organizations Taxpayers
Group II	Co-workers and unions Management and business Legal system Transportation industry Communication industry
Group III	Engineering and architecture professions Training and counseling professions Medical profession Other users of transportation and communication systems Community zoning boards Health care organizations Insurance industry Educational system Parent Teachers Associations, etc. Criminal institutions, especially juvenille

Figure 6-2. List of affected parties

The analysis indicates that assessment of the effect of a rehabilitation program on a particular individual, group, or organization must include careful consideration of the relationships among those affected, the program thrust variables, and relevant societal variables.

The analysis indicates that the other important consideration is the time-dependent nature of the effects. The effects of rehabilitation programs occur over a continuum of time to produce near-term, intermediate-term, and long-term effects. Near-term effects are those which tend to be proportional to the causal agent and which occur without significant time delay. Thus, all parties to a relationship pass the effect along, attenuated or amplified, immediately.

Long-term effects accumulate (or dissipate) the cause only with the passage of time. Thus, parties linked only by long-term effects pass the effect along, delayed by the time required to accumulate or dissipate a significant amount of the cause.

Intermediate-term effects are combinations of short-term and long-term effects simultaneously present in a set of relationships among affected parties. Some of the cause is passed along and "felt" immediately, while some accumulates or dissipates only with the passage of time. Co-workers of disabled persons whose jobs have been obtained by affirmative action practices are likely to exhibit near-term hostility which is lost in a dissipative fashion over months and years because of the presence of the disabled within society. While the overall effect appears to be intermediate in term, the effect is really a combination of both a near-term (proportional) effect and a long-term (accumulative or dissipative) effect.

CONSEQUENCES

If a consequence is described as a generalization of a specific set of effects acting through time, then the consequence is a multi-dimensional quantity consisting of both direct and indirect effects, parties affected, and the time dependent behavior of both near-term and long-term effects.

The work-session consequence analysis has shown that near-term consequences primarily tend to involve disabled persons, direct effects upon life functions, and indirect effects upon families of disabled persons.

Intermediate-term consequences tend to involve direct and indirect combinations of near-term and long-term effects on the technological community or organizations and on government.

Long-term consequences tend to be the direct and indirect long-term (cumulative) effects upon society in general and the national economy. A summary of these observations is shown in figure 6-3.

Program Thrust Initiated Leads to	Related to
Near-term consequences	Age of disabled population targeted Life function being improved Family of the DA Funding
Intermediate-term consequences	Other affected parties Technological community, somewhat dependent on rehabilitation tech. employed Organizations, government and industry
Long-term consequences	Overall society The economy

Figure 6-3. Program thrust consequences

More specific consequences are listed in figure 6-4. These consequences, arrived at by work-session and project-team analysis, are representative generalizations of the effects programs using rehabilitation-technology will have in the future. The consequences are, to a limited extent, technology-, life-function-, and program-thrust dependent. Technologies which are used, life-functions which are improved, and programs which are developed can alter these consequences, although such alterations probably will not change the basic nature of a specific consequence. These consequences are listed at length in appendix C and described in detail in volume V of the reports supplementary to this volume.

The use of these consequences is two fold. First, they provide a qualitative idea of the possible role of rehabilitation in future American society. Second, they indicate the need for construction of a generalized model of the interactions related to rehabilitation in American society.

Near-Term Consequences

Environmental Change	Physical Intervention	Training & Counseling
Technologies primarily improve mobility and social attitudinal life functions of disabled	Technologies primarily improve health, social/attitudinal and one other life function of disabled	Technologies primarily improve cognitive/intellectual and communication life function if disabled

Improved self-image of disabled
Increased visibility of disabled
Improved family functioning for the disabled
Potential increase in funding for basic and applied research
Need to educate disabled to utilize the program
Need for government review of spending plans for social needs

Figure 6-4. Consequences of rehabilitation programs.

Intermediate-Term Consequences

Demand by disabled for transportation

Increase in quackery

Greater need for special education teachers

New market generated for technology

Possible increase in "hasty technologies" being employed, lowering efficiency

Increase in educational facilities required

Increased need for engineers, designers, etc. trained in environmental modifications

Increased government agency controls

Possible reduction in juvenile deliquency

Increased demand by disabled for services and benefits

Increased safety requirements

Improved access to jobs
Need for training, matching of jobs to skills
Increase in disabled employed
Some economic benefit to industry if additional employees needed and disabled fill positions
Additional costs to industry for changes, increased safety requirements, etc. associated with hiring disabled
Increase in adjunct rehabilitation programs
Potential increase in political power of the disabled

Long-Term Consequence

Possible negative reaction by able bodied workers and specific organizations, e.g., unions, minorities, etc.
Possible supplemental income decrease
Possible improvement in able bodied attitude if rehabilitation program changes are beneficial to them also
Possible reluctance by disabled in using cumbersome compensating devices
Possible increase in hereditary disorder due to increased marriage and family activity by the disabled
Possible equity problems regarding who should receive rehabilitation technology
Potential decrease in public attitude toward rehabilitation and maintenance programs as costs and tax burden increase
Possible effect of some programs on international scene if rehabilitation technology is exportable

Figure 6-4 (Continued). Consequences fo rehabilitation programs

A GENERALIZED CONSEQUENCE MODEL

Subsequent to panel meetings, the causal models for each of the program thrusts were examined by project team members in conjunction with the work-session consequence statements produced by the work sessions. The project team concluded that a generic model composed of representative affected parties, relationships, and effects could be constructed to portray more graphically the time-dependent behavior of these effects when the effects occur simultaneously. In addition, such a model, when implemented as a GSIM computer program, could be driven by projections of scenario variables to evaluate the team's observations about near-term, intermediate-term, and long-term consequences.

The first step in producing a generalized model consisted of close examination and compilation of data on all of the affected parties, individuals, organizations, and effects found in the work-session models. These are listed in tabular form in appendix C.

The variables from the individual program thrusts were consolidated and generalized into a list of 20 for use in the generic model of rehabilitation-oriented social dynamics. Table 6-2 lists the resulting generalized variables.

The second step consisted of a determination of the relationships among generalized variables implied by the specific relationships found in the work-session causal models. Ultimately, a causal diagram for the generalized-consequence model was obtained as shown in figure 6-5. This diagram effectively portrays the direct and indirect effects observed in the work-session reports.

Since time-dependent behavior is the other important consideration, the team identified a specific relationship as being near-term or long-term in its effect. Near-term effects are modeled as proportional effects denoted by (P ± n) written beside a relationship designation. Long-term effects are modeled as accumulative effects denoted by (A ± n) written

TABLE 6-2
CONSOLIDATION AND GENERALIZATION OF VARIABLES AND PARAMETERS

Variable	Letter Designation
SCENARIO GROUP	
Societal Capability	A
Tax Willingness	B
Funds for Social Needs	C
Disabled Population	D
PROGRAM-THRUST GROUP	
Public Attitude	F
Level of Program Funding	E
Governmental	
Corporate	
Private	
Rehabilitation and Program Thrust	L
Research	
Basic	
Applied	
Education and Training	
Disabled Persons	
Technologists	
Health-Care Professionals	
Services	
Medical	
Non-Medical	
Locus	
Management	
Administration	
Control	
Organization	
Locus	
Manpower	
Trained Technologists	
Health-Care Professionals	
Rehabilitation Technologies	
Market for Rehabilitation Technologies	
Resistance to Program Changes	
Quackery	
Utilization by the Disabled	

TABLE 6-2 (CONTINUED)
CONSOLIDATION AND GENERALIZATION OF VARIABLES AND PARAMETERS

Variable	Letter Designation
Facilities for the Disabled	I
Facilities for the Nondisabled	H
Costs	J
Research	
Education	
Services	
Management	
Manpower	
Technology	
Family Costs	
Welfare System	
Criminal System	
Advocacy Position	G
Regulation	K
CONSEQUENCE GROUP	
Life Functions	O
Mobility	
Social-Attitudinal	
Communication	
Cognitive-Intellectual	
Health	
Status of the Disabled	N
Self-Image	
Visibility	
Community Integration	
Access to Jobs	
Employment	
Income	
Earned	
Supplemental	
Political Influence	
Education	
General	
Vocational	
Education Technology	
Demand	
Proxemics	
Status of Families with Disabled Member	P
Sibling Life Functions	
Parent Life Functions	

TABLE 6-2 (CONTINUED)
CONSOLIDATION AND GENERALIZATION OF VARIABLES AND PARAMETERS

Variable	Letter Designation
Total Labor Force	R
Total Employment	S
Total Jobs Available	Q
Economic Productivity	T
Disabled	
General Population	
Perceived Environment	M
Directly Related	
Incidentally Related	

NOTE: '*p*' indicates a proportional coupling. '*a*' indicates an accumulative coupling, and the letters in parenthesis are used to simplify variable references in the causal diagram.

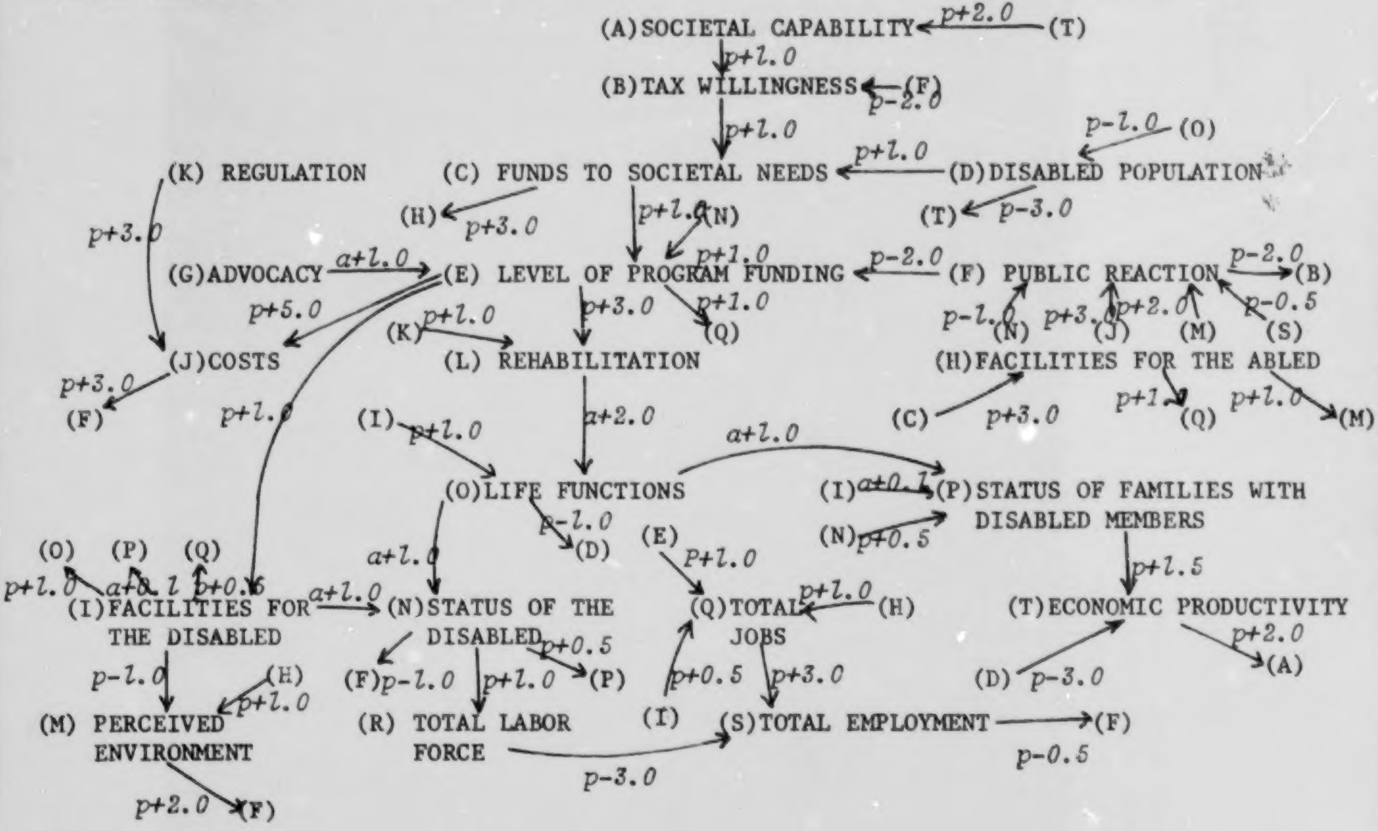

(A)SOCIETAL CAPABILITY
p+2.0
(T)
p+1.0
(B)TAX WILLINGNESS
(F)
p-2.0
p+1.0
p-1.0
(O)
(K) REGULATION
(C) FUNDS TO SOCIETAL NEEDS
p+1.0
(D)DISABLED POPULATION
(H)
p+3.0
p+1.0
(N)
(T)
p-3.0
p+3.0
p+1.0
(G)ADVOCACY
a+1.0
(E) LEVEL OF PROGRAM FUNDING
p-2.0
(F) PUBLIC REACTION
p-2.0
(B)
p+5.0
p+1.0
p+3.0
p+1.0
p-1.0
p+3.0
p+2.0
p-0.5
(K)
(Q)
(N)
(J)
(M)
(S)
(J)COSTS
(L) REHABILITATION
(H)FACILITIES FOR THE ABLED
p+3.0
(F)
p+1.0
(I)
p+1.0
a+2.0
(C)
p+3.0
p+1.0
(Q)
p+1.0
(M)
a+1.0
(O)LIFE FUNCTIONS
(I)
a+0.1
(P)STATUS OF FAMILIES WITH DISABLED MEMBERS
p-1.0
(D)
(N)
p+0.5
(O)
(P)
(Q)
(E)
a+1.0
p+1.0
p+1.0
a+0.1
p+0.5
p+1.5
(I)FACILITIES FOR THE DISABLED
a+1.0
(N)STATUS OF THE DISABLED
(Q)TOTAL JOBS
p+1.0
(H)
(T)ECONOMIC PRODUCTIVITY
p+0.5
p+2.0
p-1.0
(H)
(F)
p-1.0
p+1.0
(P)
(A)
p+1.0
p+0.5
p+3.0
(D)
p-3.0
(M) PERCEIVED ENVIRONMENT
(R) TOTAL LABOR FORCE
(I)
(S)TOTAL EMPLOYMENT
(F)
p-0.5
p-3.0
p+2.0
(F)

Figure 6-5. Causal diagram for the generic model

beside a relationship designation. The number after the sign indicates the relative strength of the relationship, and the sign indicates whether the effect is proportional or inverse, accumulative,or dissipative.

As a whole, the GSIM model satisfies the requirement for portraying both the direct and indirect effects, and the near-term, intermediate-term, and long-term behavior of rehabilitation variables. Figures 6-5 contains the GSIM proportional and accumulative values used to simulate the time-dependent behavior within the generic model.

Interpreting Results from the GSIM Computer Model

The results which follow are based on the causal model. Although the values determined for "1950" as well as the strengths of the relationships are the "best estimates" of the group of individuals participating in the project, they are nevertheless judgmental estimates.

Four variables play an important role in an examination of the dynamics of the generic model and the sensitivity of these dynamics to changes in scenario. These variables are societal capability, willingness to be taxed, funds to social needs, and size of disabled population. Historical information about these four variables was obtained for the period 1950 to 1975, and a series of projections based on three scenarios was created for the period 1975 to 2025 (chapter 5). Ultimately, the three scenarios provide data to be used to "drive" the generalized GSIM computer model to obtain six sets of dynamic variables. Each set of scenario data was used, first under the assumption that there would be no limit on tax willingness (unconstrained) and then under the assumption that when tax willingness crossed the 0.5 level, a strong negative impact on funds to societal needs would occur (constrained). This impact modifies the projected scenario for funds to societal needs.

The scenarios have provided assumptions about the states of society within which rehabilitation technology is developed and implemented. The six different projections into the future are based on scenarios representing (1) moderate growth in funding to societal needs (designated *MEDIAL*, and denoted by the letter "M" on the plots), (2) moderate growth in funding to societal needs constrained by tax willingness (designated *MEDIAL-C*, and denoted by the letters "M_c" on the plots), (3) an increased growth in funding to societal needs (designated *UPPER*, and by the letter "U" on the plots), (4) an increased growth in funding to societal needs constrained by tax willingness (designated *UPPER-C*, and by the letters "U_c" on the plots), (5) a reduced growth in funding to societal needs (designated *LOWER*, and by the letter "L" on the plots), (6) a reduced growth in funding to societal needs constrained by tax willingness (designated *LOWER-C*, and by the letters "L_c" on the plots). Each of the figures represents one of the variables and shows the dynamic behavior or the variable for each of the six projections into the future.

Only four of the plots (societal capability, tax willingness, funds to societal needs, and disabled population) associate an actual value with the relative scale 0.0 to 1.0. These plots are the projected scenario data used to drive the model. The plots which have been generated by the computer model of these four scenario variables are shown in figures 6-6 through 6-9.

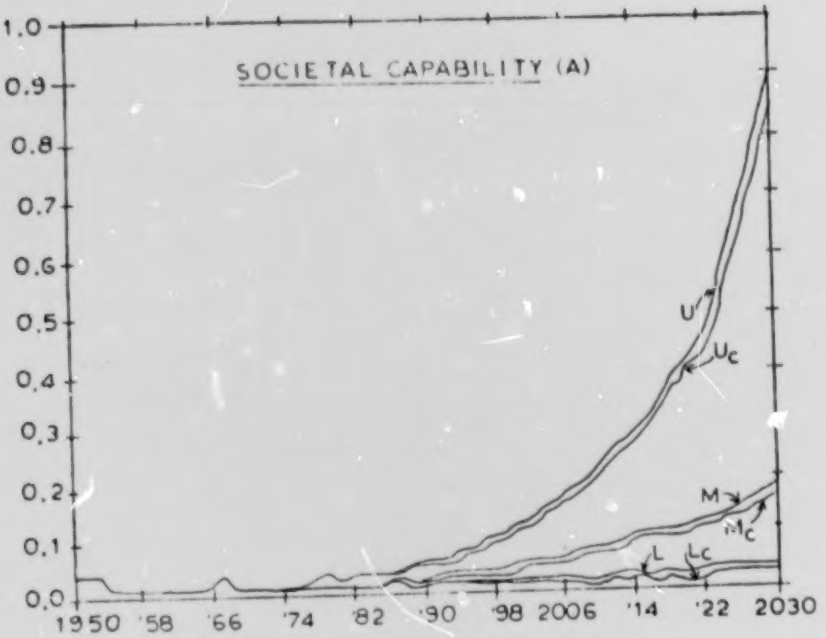


Figure 6-6. Societal capability(A)

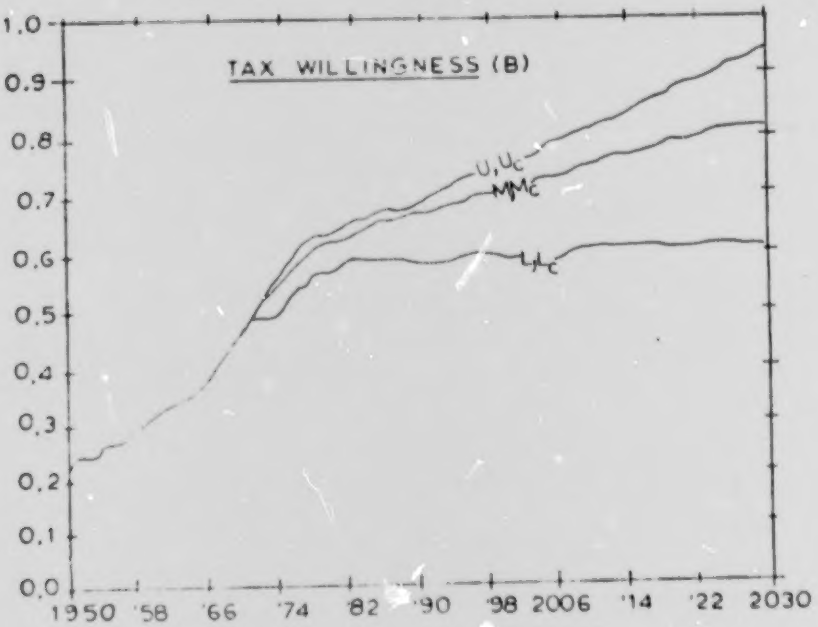


Figure 6-7. Tax willingness (B)

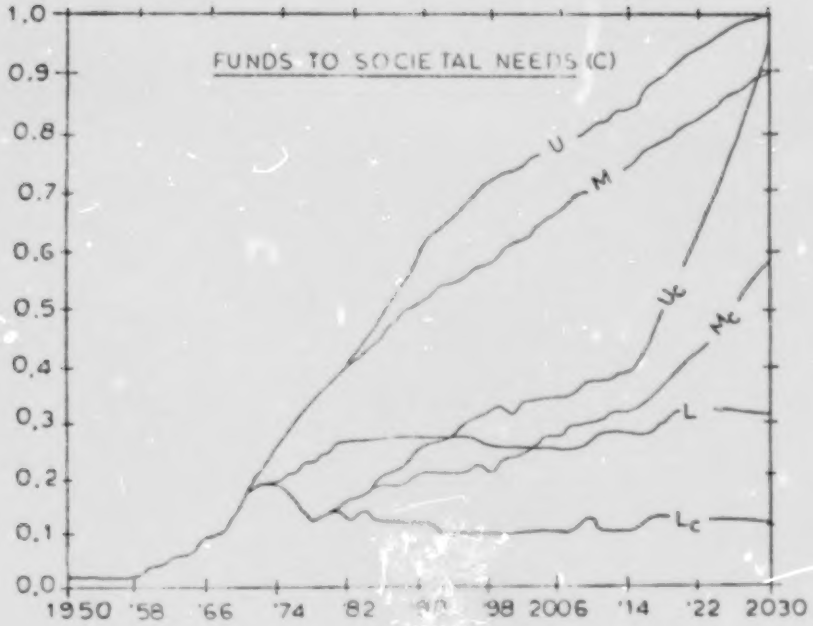


Figure 6-8. Funds to societal needs (C)

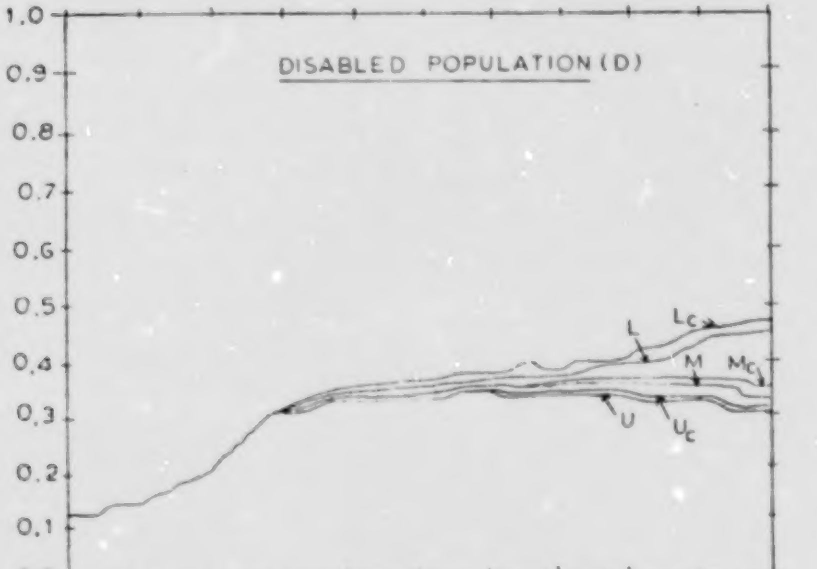


Figure 6-9. Disabled population(D)

Even though the information that drives the model was obtained from historical data from 1950 to 1975 and scenario-based projections provide data between the years 1975 to 2025, the model "feeds back" impacts on these projections that modify trends as though the dynamics of the model began in 1950. Figure 6-6 showing societal capability, illustrates these slight modifications of projected scenario data that induce small changes in known "historical" data.

Summary of Computer Modeling Results

Figures 6-10 through 6-25 summarize the modeling results for the six cases. Each figure contains the dynamics for one variable for six assumptions about the future scenarios denoted M for *MEDIAL*, M_c for *MEDIAL-C*, U for *UPPER*, U_c for *UPPER-C*, L for *LOWER*, and L_c for *LOWER-C*. The maximum variation in a variable occurs between the *UPPER* scenario and the *LOWER-C* scenario. Two variables, advocacy position and regulation, were assumed constant throughout the simulation because work-session participants could not arrive at any estimate of relative values of these variables, and they could not determine what other variables affected them. The scales on figures 6-10 through 6-25 are relative scales where the value 1.0 represents the level at which outside factors become significant in limiting further growth of a variable, and the level 0.0 represents the level at which a variable has negligible effect on the dynamics of the system. All of the figures are presented in a group prior to discussion to permit conceptual review in light of the data presented in previous chapters, of the variables defined in table 6-2, and the relationships shown in figure 6-5. Formulation of some impressions of rehabilitation in society, affected parties, relationships of variables, and possible consequences should aid in understanding the discussion that follows.

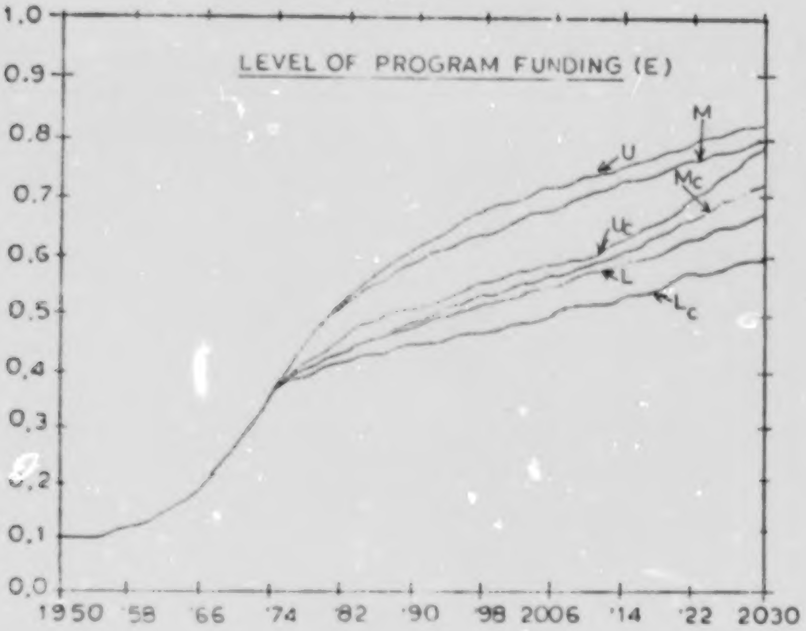


Figure 6-10. Level of program funding (E)

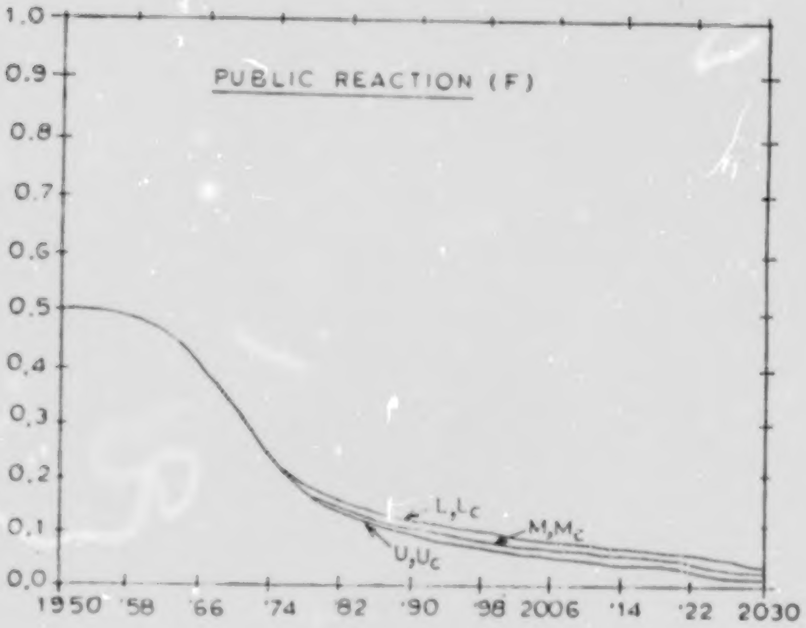


Figure 6- 11. Public reaction (F)

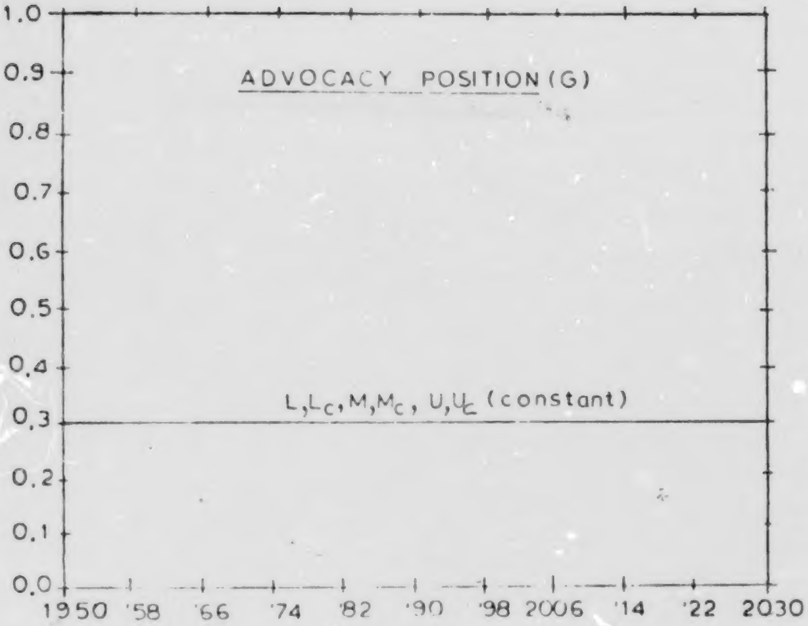


Figure 6- 12. Advocacy position (G)

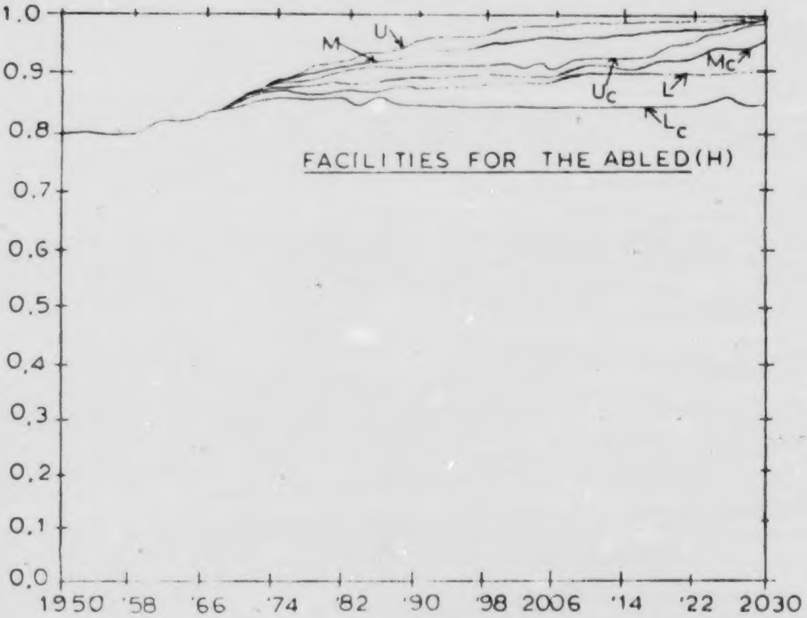


Figure 6-13. Facilities for the abled (H)

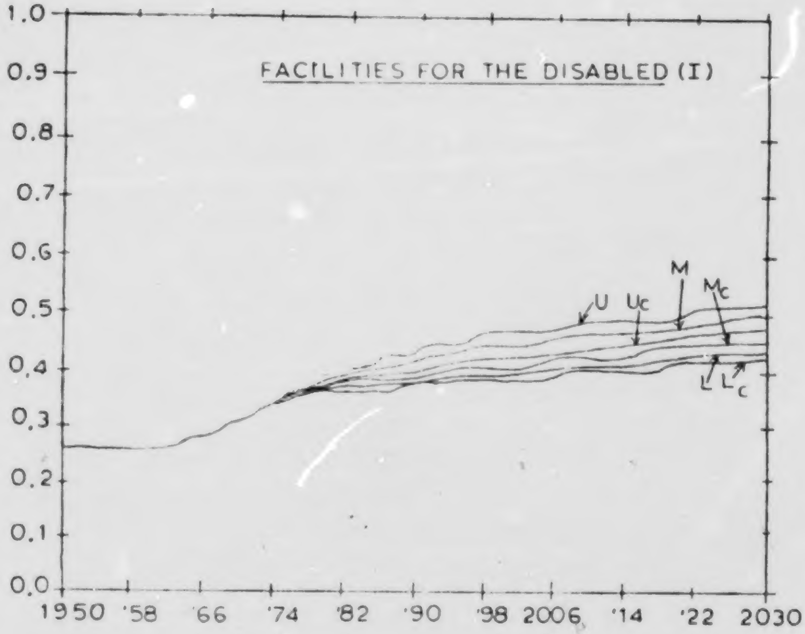


Figure 6-14. Facilities for the disabled (I)

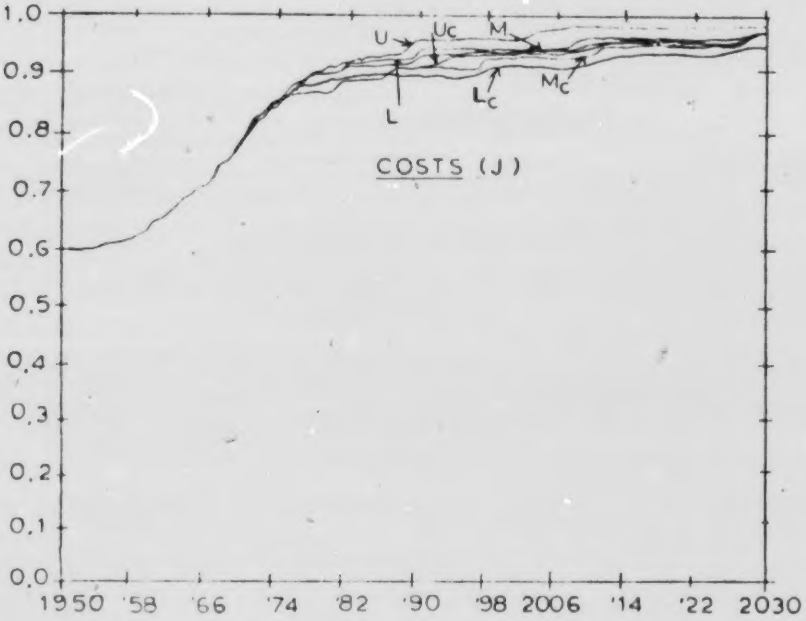


Figure 6-15. Costs (J)

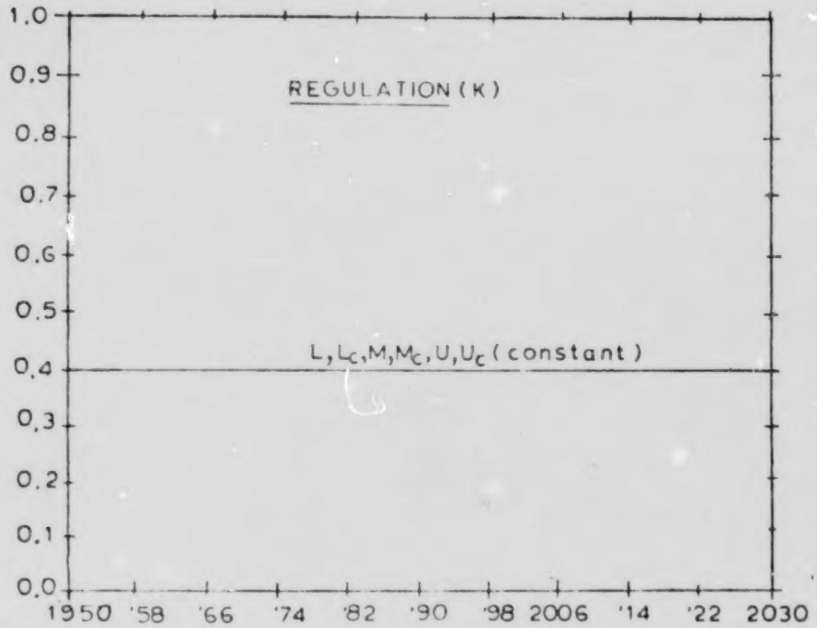


Figure 6-16. Regulation (K)

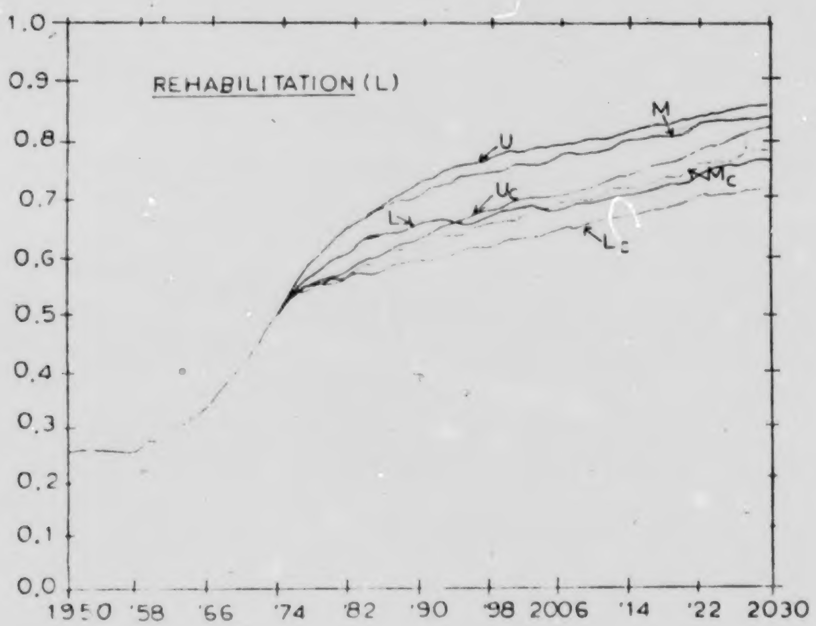


Figure 6-17. Rehabilitation (L)

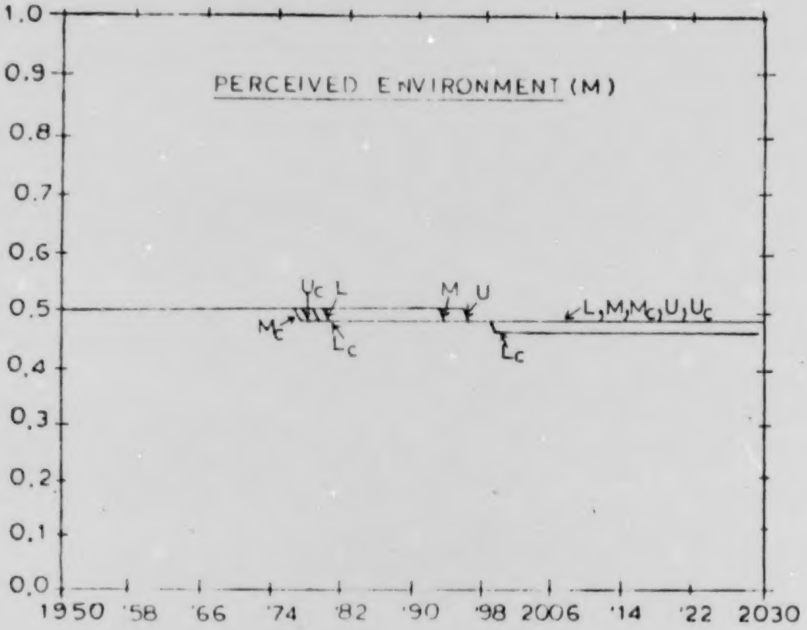


Figure 6- 18. Perceived Environment (M)

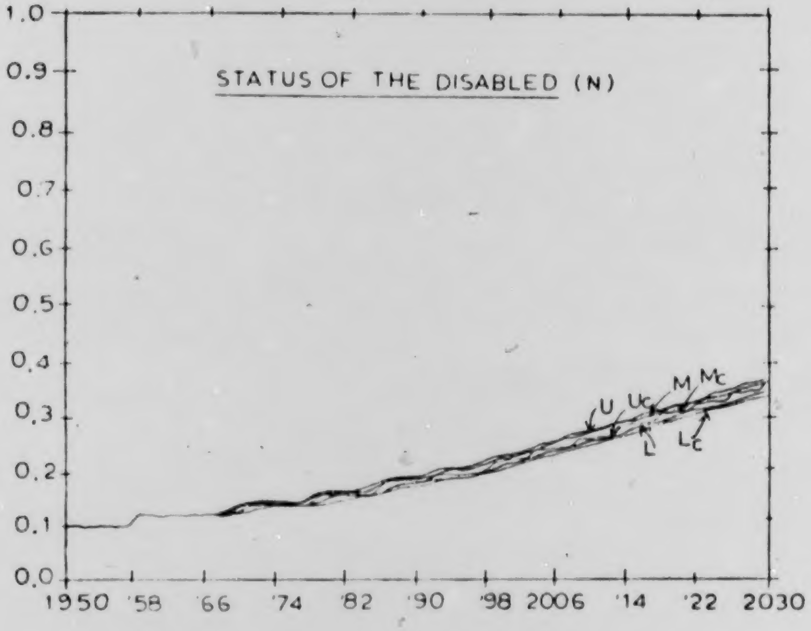


Figure 6- 19. Status of the disabled (N)

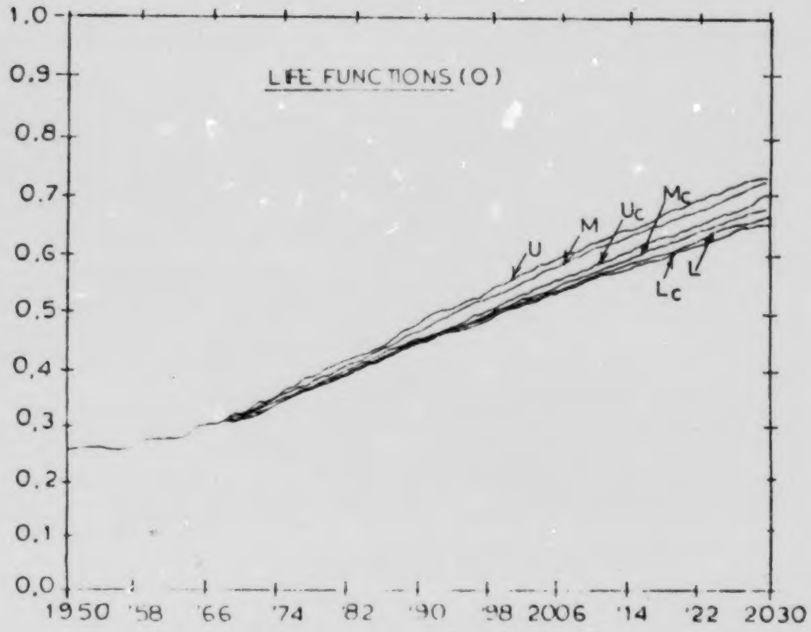


Figure 6-20. Life functions (O)

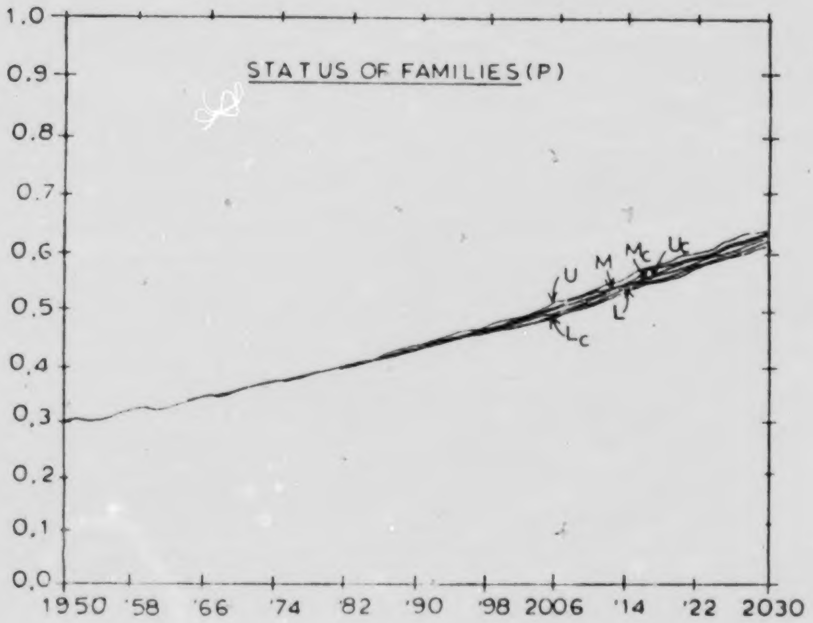


Figure 6-21. Status of families (P)

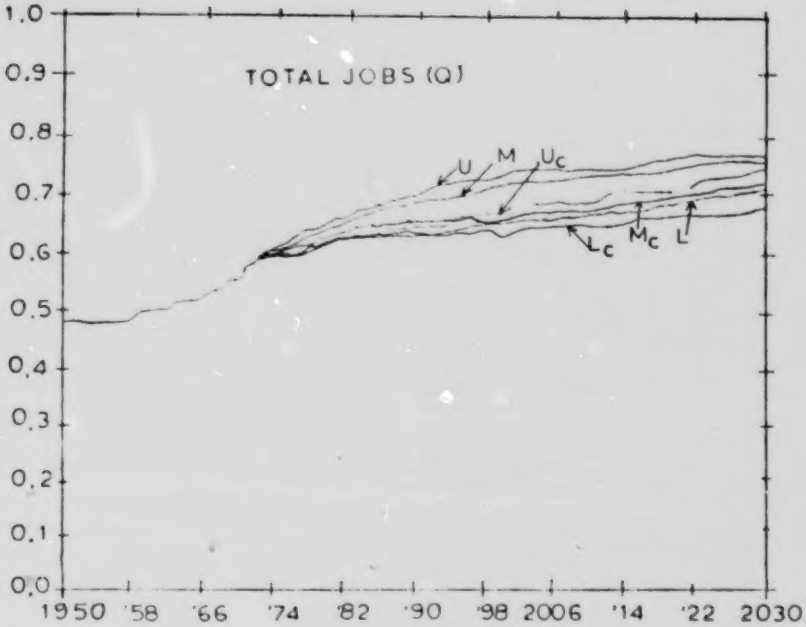


Figure 6-22. Total jobs (Q)

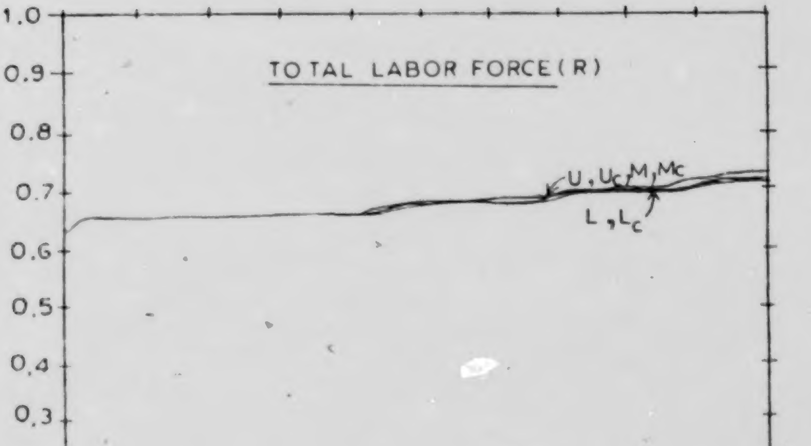


Figure 6-23. Total labor force (R)

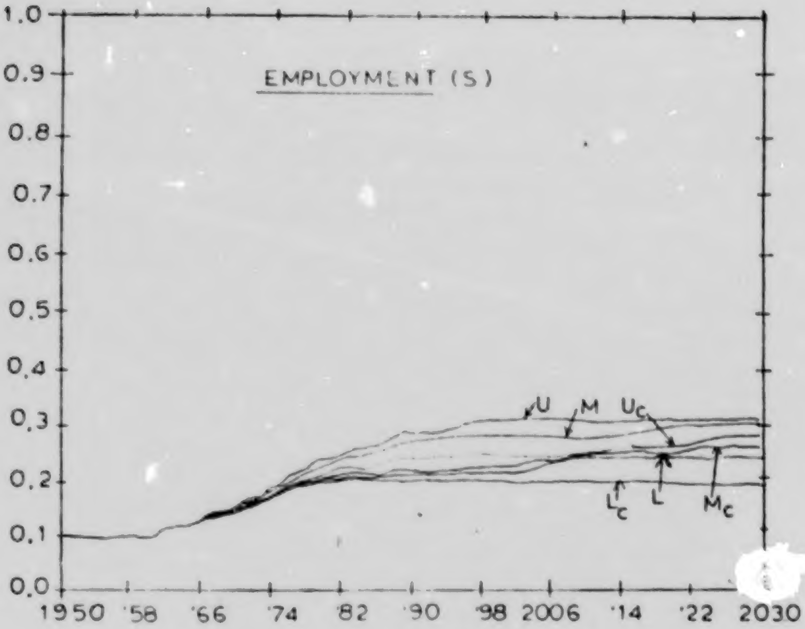


Figure 6-24. Employment (S)

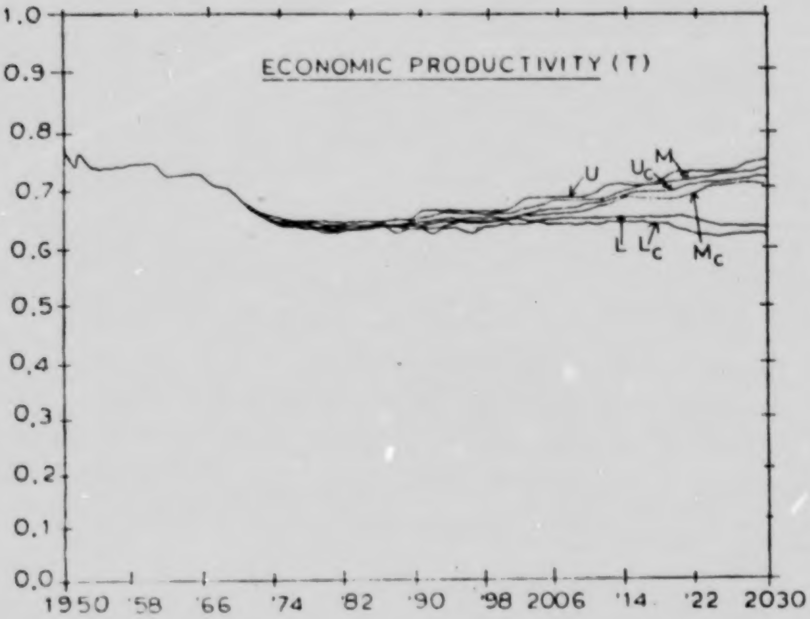


Figure 6-25. Economic productivity (T)

The variables may be ranked in order of decreasing "sensitivity" to scenario. Figure 6-26 presents this ranking.

The three most sensitive variables are in the program-thrust groups "level of program funding," "facilities for the abled," and "rehabilitation" (E, H, L, figures 6-10, 6-13, 6-17). These three variables receive direct proportional impacts from funds to societal needs (C, figure 6-8). The general trends follow the trend shown by the scenario variable of tax willingness (B, figure 6-7). The results show that facilities for the nondisabled, though sensitive to scenario, increase slowly because the collective opinion of the work-session participants indicated an initial value corresponding to 1950 to be 0.8. The initial values for 1950 and for 1975 for level of funding and rehabilitation were estimated from the available data of actual expenditures in these areas. Thus, the trends indicated do reflect the major increases in these variables during the period 1950 through 1975.

Work-session participants concluded that level of program funding is affected positively by funds to social needs, advocacy, and status of the disabled and slightly negatively by public attitude. Status of the disabled is affected by life functions and facilities for the disabled. Thus, the relationships shown by the curves are the cumulative effects occurring within the system.

The most sensitive variables from the consequence groups are economic productivity (T) and total employment (S), as shown in figures 6-24 and 6-25. These variables are impacted by counterbalancing proportional influences. Economic productivity is directly affected by status of families with disabled members and by the disabled population and indirectly affected by the scenario variables. Thus, the trends of the two variables, (T) and (S), emanate in the disabled and rehabilitation system. Employment of the disabled is

PROGRAM THRUST GROUP*	CONSEQUENCE GROUP
1. Level of Program Funding (E)	
2. Facilities for the Abled (H)	
3. Rehabilitation (L)	
	4. Economic Productivity (T)
	5. Total Employment (S)
6. Facilities for the Disabled (I)	
	7. Total Jobs (Q)
	8. Life Functions (O)
9. Public Reaction (F)	
10. Costs (J)	
	11. Status of the Disabled (N)
	12. Perceived Environment
	13. Status of Families with a Disabled Member (P)
	14. Total Labor Force (R)
15. Advocacy [a constant (G)]	
16. Regulation [a constant (K)]	

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*The scenario variables do not appear in the ranking since they are the "independent" variables which drive the model.

Figure 6-26. Ranking of generalized variables by decreasing sensitivity to scenario

scenario-dependent, with an increasing trend except under the *LOWER* scenario. Forecasts of productivity indicate a time lag within any program adopted to encourage employment of the disabled.

The category "facilities for the disabled," (I) in figure 6-14 receives a direct, proportional impact from level of program funding (E) and shows a relatively strong sensitivity to scenario. A continual upward trend is also shown for this variable indicating the accumulative effects of programs.

Within the consequence group, total jobs (Q), and life functions (O), figures 6-20 and 6-22, are subject to multiple influences and are thus sensitive to scenario influence. Life functions (O) receive an accumulative impact from rehabilitation (C) as well as a proportional impact from facilities for the disabled (I). Thus life functions (O) show both the long-term accumulation of rehabilitation as well as some sensitivity to scenario influence through facilities for the disabled.

Public reaction (F) and costs (J) from the program-thrust group are relatively insensitive to scenario. Public reaction (F) is another variable driven by counterbalancing influences which tend to cancel some variations caused by scenario. Costs (J) are seen to be driven by proportional influences which, while scenario-sensitive, increase until some factor outside the system limits further increases.

The least sensitive variables are status of the disabled (W), perceived environment (M), status of families with a disabled member (P), and total labor force (R). The lack of sensitivity to scenarios is seen to be the result of weak accumulative effects on status of the disabled, which tend to integrate variations caused by scenario. Counterbalancing influences account for the low sensitivity of perceived environment (M). Weak accumulative and proportional effects on status of families with a disabled member (P) result in low scenario-sensitivity. A proportional coupling to status of the disabled (N), the variation of which is limited, results in a low sensitivity of total labor force to scenario. Though relatively insensitive to scenario, status of the disabled (N) and status of families with disabled members (P) show an increasing trend which is probably caused by continued accumulative effects of programs already adopted and by new programs.

CONCLUSION

The work-session panels focused as concretely as possible on specific program thrusts. The data base for the GSIM model, as well as the logical structure of the model itself, has been extrapolated from the concrete variables identified during the work-session conference. A focus on specific program thrusts enabled work-session participants to elucidate rehabilitation variables as numerous and diverse as those which were eventually used in the GSIM model. More abstract speculation on general variables in rehabilitation technology than that undertaken during the work-session conference would have produced perhaps more fanciful speculations but little reliable data. Also, loftier speculation on the complex multiple interrelationships of the variables identified in the work sessions would have been far too complex a task for rigorous verbal analysis during the time allotted for the work-session conference. The computer model based on these variables, however, provides a concise, complete generalization and summation of the complex data generated during the work-session conference. The GSIM model provides a general background against which proposed policies may be designed and evaluated.

CHAPTER 7

GENERAL POLICYMAKING CONCLUSIONS AND RECOMMENDATIONS

The results of this project are presented in the preceding chapters of this report. This chapter generalizes these results into a set of issues which are central to rehabilitation-related policy, and the chapter offers a number of both broad and specific policymaking recommendations.

Issues described in this chapter in many cases reflect experience gained during the process of gathering results for this study. Many problems were encountered by researchers and analysts in their compilation of vast amounts of data from extremely diverse sources. Knowledge about the nature, availability, amd meaning of data revealed by the research experience is, itself, a useful policymaking resource. In other cases, the issues described in this chapter are perceived to be substantively rooted in American society, in rehabilitation programs and techniques, and in policymaking dynamics.

The conclusions to this project and recommendations based on them point to several distinct areas for potential policymaking action. It is hoped that this material will promote the development of clearer definitions, new and standarized conceptualizations of rehabilitation and its objectives, better rehabilitation-oriented information systems and new or modified approaches and institutions to coordinate the efforts at human rehabilitation.

LIMITATIONS OF THIS STUDY

The recommendations within this chapter are based on conclusions in part following from characteristics and assumptions which project participants believed to be representative of ongoing processes in rehabilitation and society. These have been explicitly defined as follows.

1. Government-ensured egalitarianism, providing the disabled and other disadvantaged individuals with opportunity for "life, liberty, and the pursuit of happiness" approximately equal to that of nondisadvantaged individuals, is likely to continue.
2. Government legislation in, funding for, and administration of social-welfare programs will continue to increase.
3. Refinement and sophistication of social-welfare programs, along with a greater proportion of governmental resources being devoted to social needs, will elicit an increasing demand for greater accountability by program administrators and participants.
4. Increased resources devoted to social-welfare programs must be obtained from either increased productivity or reallocation of public or private resources currently devoted to other types of programs.
5. Governmental expenditures will continue to be funded primarily through taxation.
6. The present goal of rehabilitation--to improve the social well being of the disabled by integrating them into society and, if possible, into the workforce--will continue, at least for the immediate future.
7. As technology develops, there will be improvement in rehabilitation techniques.

These assumptions are thought to be reasonably well grounded in that they appear to have been increasingly ingrained in the American culture throughout recent years. They are not, however, inviolable laws to which human beings within American society are irretrievably bound. Many possible future events far less serious than global warfare or widespread natural catastrophe could lead to a reduced level of confidence in the assumptions as elements of future American society.

Other reasons for caution in the use of these recommendations center on the methodology of technology-assessment research. Maximum utility is probably realized when the recommendations are viewed as elements in a logical roadmap, rather than as categorical assertions about what should or should not be done.

It is important to note that present American culture and language is publically pervaded by humanitarianism. Everyday language contains many presently unnoticed assumptions which may become unreliable as bases of technology assessment. By the language, for example, "the disadvantaged ought to be aided and the disabled ought to be able to function as well in American society as other human beings can," a distinctively normative character is added to the enterprise. The problem inherent to technology assessment is that this kind of language can filter unnoticed into the assessment assumptions. And, as unnoticed assumptions, religious and moral sentiments become influences within policymaking operations. They should not become part of the methodology of the logic-based operations with which technology assessment is concerned. That "disabled persons must be provided for by American society," may be a belief of 10- to 100-million American citizens which tips, or fails to tip, interest group-appraisal "scales" involved in the policymaking process. The belief, however, does not reflect, in itself, the way either rehabilitation systems or social patterns are structured. The way these two elements interact is the subject-matter boundary of this technology assessment.

BROAD ISSUES AND RECOMMENDATIONS

PROGRAM ORGANIZATION AND ADMINISTRATION

ISSUE 1: STANDARD DEFINITIONS OF DISABILITIES

PROBLEM

The lack of adequate standardized data which defines and describes disability and disability related problems is so acute that objective policy decisions at all levels are made unnecessarily difficult.

DISCUSSION

One of the major findings about disability which emerges from this project is that "problems" have not been defined. Disabilities in general have no standard definitions, and adequate systems for classifying subgroups within disabilities, either by severity or subtype, are lacking. The lack of useful standard definitions of disabilities creates problems first noticeable in an attempt to develop a clear and comprehensive picture of the size and distribution of the disabled population within the United States today. Prevalence, incidence, and mortality statistics on various disabilities are all so intimately tied to imprecise definitions of the disabilities that seemingly simple questions, such as "How many persons in the United States are deaf or blind in 1977?," become nearly impossible to answer with any acceptable level of confidence.

There are definitions of blindness and deafness, and some policymakers may consistently adhere to one definition or another. But there is no one definition which members of the scientific community, the business community, the governmental community, and the rehabilitation community all agree should be used as a standard against which to measure the number and degree of blindness or hearing disability in America today.

The lack of adequate or standard definitions makes an accurate data base on disability (a national census to determine how many people in the population have conditions which would classify them as "disabled" under a standard accepted definition as well as the needs of the disabled) an impossibility. In the absence of a "Bureau of Standards" for definitions and prevalence associated with disability, policymakers must view expert testimony about disability with some skepticism since the current state of definition prohibits policymakers from determining the validity of prevalence information provided. Without an adequate data base, informed policymaking involving multiple disability groups is, clearly, quite difficult.

RECOMMENDATIONS

1. Consideration should be given to developing a national effort to standardize definitions of disability in general (i.e., what constitutes a disability) and to develop classifications, types, and levels of specific disabilities.
2. A standard method for conducting prevalence studies should be developed. The methodology for determining prevalence depends heavily on definitions of disability.
3. Studies of the prevalence of disability should explicitly address the question of multiple disability and determine the extent to which individuals have two or more disabilities.
4. At present, the Rehabilitation Services Administration definition of the severely disabled is not widely used. Also, there is no certainty that persons with the disabililities listed in the definition are severely functionally impaired, or that persons whose disabilities are not listed are not severely impaired in functioning. The Rehabilitation Services Administration might consider, therefore, to continue to refine the definition of severe disability so that it is stated in terms of functional needs and needs for service, providing for more widespread use.

ISSUE 2: RELATIONSHIP BETWEEN DISABILITY LABEL AND FUNCTIONAL NEEDS

PROBLEM

It has been very difficult throughout this project to obtain information about the range of functional needs within any disability group, although enough evidence has been compiled to indicate that the diversity within groups is immense. If it is the case that variability within groups is greater than variability between groups, the whole concept of providing services on the basis of diagnostic label is questionable.

DISCUSSION

As project team members undertook the task of gathering information about the needs of the disabled persons, it became evident that a conceptual framework was needed for describing the needs of all disabled groups. The language which has evolved around particular disability groups for describing rehabilitation needs or impact of the disability was not in most cases transferable to other disabilities.

The concept of the life function analysis was developed to provide a model upon which needs could be described without categorization by disability. Multiple disabilities were reflected in greater numbers of life functions being affected.

The life function model is a convenient starting point for "trans-disability" definitions, even within the context of inadequate definitions of disability and specific disabilities. Functional definition of the rehabilitation needs of the disabled population, regardless of the condition or conditions which cause impairments can be a viable basis for reorganization of a fragmented service delivery system heretofore organized along diagnostic-label lines. Reorganization may solve, for example, problems faced by many disabled persons in riding buses. The blind are handicapped in using buses because they can neither read the schedules nor see route markings. The mentally retarded are handicapped in using buses independently because they understand neither the routes nor the schedules. The spinal-cord injured and persons confined to wheelchairs are handicapped in using buses independently because a wheelchair cannot be easily loaded onto or off of a bus. The cerebral palsied are handicapped in using buses because the use of walking aids or wheelchairs is not compatible with rapid movement up and down steps in a bus. This listing of handicaps is of course only a partial list for only four disability groups, but it is sufficient to show the diverse handicaps which prevent independent use of buses by disabled persons. If each of these handicapping conditions is not viewed as a separate problem for each disability, the conditions can be cast into a functional model which analyzes the problems in terms of which life functions are affected and how they are affected. The "handicaps" can be seen in a different perspective. All four types of individuals can be limited in the life function of mobility; they are all potentially dependent upon public transportation for mobility around the community. In the case of the first two types of individuals, the primary life function affected (which in turn affects mobility) is that of communication. In the case of visually impaired individuals, it is a receptive communication deficit, but only in the visual mode. In the case of mentally retarded individuals, the primary communication problems are receptive in the visual mode and expressive in the verbal mode. The third and fourth types of individual, while limited in the mobility life function, are not absolutely limited in getting into buses, interpreting schedules, or using route information. They are nonetheless significantly restricted in that their wheelchairs cannot easily negotiate bus design. One machine simply is not compatible with another machine.

The process of casting problems into a model such as life-functions analysis suggests the solution of problems which cut across various disabilities and other social problems as well. Also, it is possible to see that individual's with these disabilities are not really different (in terms of life functions affected) from other members of our society such as the very young, the elderly, foreign persons, or illiterates who do not understand the English language. Some nondisabled members of society may have problems using public transportation for exactly the same reasons as the "disabled."

The life-function model is based on assumptions about the ways all persons function in work, in the community, and in social interactions with others. The functions of daily living can be described by a set of life functions: health, mobility, communication, and cognitive-intellectual and social-attitudinal functions. Within each of these life functions there is a continuum of functional capacity which ranges from complete capacity, at one end, to total incapacity at the other. Each individual can be described in terms of a profile of functioning along each of the continuums. No person is completely capable or completely incapable in any of the life functions, and the extent of any person's disability is simply a function of his or her capacity in the various life functions.

RECOMMENDATIONS

1. Studies of the definition of the rehabilitation needs of the disabled should be undertaken in terms of capacity to function within various life areas; these studies should be undertaken in order to further standardize an information base upon which sound, informed rehabilitation policy can rest. Also, with data on functional-capacity limitations available for the accurate description of disability, traditional effectiveness measures can be used to evaluate rehabilitation success. Effectiveness can be measured by description of life function prior to and subsequent to the use of rehabilitation technologies.
2. There is a critical need for research directed at developing standardized methods of assessing deficiencies in life functioning across disability groups. Although some promising scales have been developed, none appear to be applicable across the entire range of disability. Such an assessment tool should meet the following criteria: (1) it should refer to specific

areas of functioning described in behavioral terms; (2) it should be brief enough that it can be used in the intake phase of service delivery to establish needs for service without requiring an extended period of evaluation; (3) it should take into consideration differences in demands for functional competence associated with age, subculture, and sex; and ( ) it should include items about characteristics of the client's environment and include a scoring mechanism which would take into account the extent and direction of environmental influences on functioning. Service delivery aimed at altering a person's environment may provide an environment with fewer handicapping features and more rehabilitative features.

3. Research should be conducted to determine the extent to which functional deficits interact with one another--for example, the extent to which a mobility deficit has secondary effects on communication or social-attitudinal functioning or health. Such research would better enable service providers to anticipate secondary effects of primary disabling condition and would suggest which types of rehabilitation technologies can have the greatest impact by indicating which problems addressed by technologies have secondary consequences which could also be alleviated by solving the primary problem--e.g., mobility.

4. Research should be conducted to determine more precisely the relationship between disability label and functional need.

ISSUE 3: PROGRAM FRAGMENTATION

PROBLEM

Current programs serving the disabled are fragmented; fragmentation creates problems in developing common program goals and objectives, coordinating services, and monitoring of effectiveness.

DISCUSSION

Current programs serving the disabled cut across dozens of governmental agencies, including the Departments of Labor, Housing and Urban Development, Agriculture, Transportation, and Health, Education, and Welfare. These programs are frequently of a generic nature rather than being categorical and serving only the handicapped.

Among the elements of various governmental programs, rehabilitation technology is merely a small component. The Comprehensive Needs Study (Chapter 3) estimates that 22 billion dollars was spent on the severely disabled in 1974. Only 2 percent of this amount, however, was spent on rehabilitation; the rest was spent on maintenance. Within the Department of HEW, 9.3 billion dollars was appropriated for medical assistance, 2.4 billion dollars for social services, and 5.9 billion dollars for supplemental security income for fiscal year 1977. These three programs are concerned with maintenance of health and a provision of minimal support of personal services and funds for housing and food. In contrast, programs which are oriented toward education and training of the handicapped and those providing rehabilitation services producing greater social and vocational independence account for only 2.2 billion dollars.

There are and have been some attempts to coordinate activities by agencies providing maintenance service with activities by agencies primarily oriented toward corrective medical services and vocational training and counseling services. The Work Incentive Program which provides funds to refer those individuals receiving public assistance to a state vocational rehabilitation agency and to assist in their rehabilitation through increased services, is an example. However, these programs are limited in scope and do not include other related agencies such as the local Federal Housing Authority in mutual planning. As a result, the disabled individual may be receiving SSI payments, job placement services, and counseling from the rehabilitation agency at the same time that he is unable to locate suitable housing or transportation.

In addition to gaps and lack of adequate follow-along services which may be important for social and vocational adjustment, the lack of common goals among agencies serving the disabled creates additional problems. The basic orientation of those administering public-assistance programs is toward a client's meeting or not meeting eligibility requirements. Food stamps, SSI, and acute medical-care services are viewed as being available on an on-going basis as long as the individual meets the eligibility requirements. Rehabilitation agencies, although committed to serving the severely disabled, still tend to accept only those clients who demonstrate vocationally feasible characteristics.

RECOMMENDATIONS

1. A top-level interagency committee of those organizations responsible for programs serving the disabled should plan goals jointly, pool funds to achieve these goals, and establish a procedure for coordinated implemention of plans.
2. There is a need for review of existing funding allocations to different disability groups to determine whether such allocations are made on the basis of functional need or on the basis of other considerations. The blind, for example, have had an effective lobby and have received special funding and programs. While the life function analysis reported in Chapter 3 indicates that the blind do indeed have substantial problems, analysis of attitude studies also indicates that the blind are not victims of negative public attitudes; they tend to be viewed sympathetically. The question raised is whether there are other severely disabling conditions which are not receiving such public attention.

POLITICAL INFLUENCE AND IMPACT

ISSUE 4: INFLUENCE OF ADVOCACY GROUPS

PROBLEM

Problem-solving policy enacted primarily at the instigation of "advocates for the disabled" may result in unsystematic or, perhaps even adverse, indirect consequences for many affected persons.

DISCUSSION

Advocacy for the disabled--particularly lobbying or policymaking self-advocacy--may not bring the same results to the disabled that it brings for other interest groups. Advocacy is based on demonstration of need and on the "visibility" of the disabled to policymakers as well as the general population. However, demonstration of need and visibility have been avoided in the past by many disabled persons. The literature of disability describes many cases in which persons qualifying for rehabilitation services have not used the services in order to avoid being classified as "blind," "deaf," and so forth. Persons who do not use rights, privileges and benefits presently offered because of the stigma attached cannot logically be expected to accept the stigma in quest for further rights, privileges, and benefits.

Militancy in self-advocacy by some disabled persons may further shrink the ranks of persons who choose to be among the "visible" disabled. Militancy is a polarizing influence which makes it even more difficult for persons who identify themselves as disabled to be truly integrated or assimilated into a society in which disability is a political issue. Public "backlash" can make integration even harder for persons who are already handicapped in their pursuit of it. Whatever good militant self-advocacy may bring to persons using the policymaking technique may easily be counteracted by harm done persons whose goals lie in complete social integration into American life.

Moreover, advocacy policymaking of any sort--including third-party advocacy--tends to identify "the disabled" themselves as a problem to be solved by policymaking. As this study clearly shows, however, it is more reasonable and productive for policymaking to consider that life-function impairment in interaction with the environment is a truly addressable problem for individual persons. Life-function impairment, identified by adequate definition and a consistent and comprehensive data base, is essentially apolitical; the use of the concept of life-function impairment will not be politically or socially of potential injury to the less visible among the disabled. In addition, the concept of life-function impairment provides logical integration of disability and disabled persons into the language-picture of nondisabled society. Visual impairment in actuality runs a continuum from none, to slight, to moderate, to acute, to total. In reality visual impairment does not heed boundaries between the putatively disabled and nondisabled. Life-function impairment, moreover, defines a problem which every person of conscience in American society would like to see solved, and in addition it defines a problem in a way that rehabilitation technology can effectively and efficiently be used to bring about solution.

RECOMMENDATIONS

1. Issues voiced by advocacy groups should receive full analysis to determine the specific problems to be solved and the best technology to apply to the solution. "Solutions" proposed by advocates should be viewed as symptomatic of the problems of disabled persons, not necessarily solutions for all disabled persons with these problems.

2. Within the rehabilitation policy area, more use should be made of life function impairment concepts rather than specific disability group "membership." Disability-group membership is a function of advocacy, rather than vice-versa, and not necessarily a function of life-function impairment.

ISSUE 5: THE HANDICAPPED AS "THE NEW MINORITY"

PROBLEM

The handicapped and their representatives are increasingly advocating their rights and interests, using the same tools of political influence used by other minority groups before them. Consequently, disability and rehabilitation are increasingly becoming politicized issues infused with emotional rhetoric voiced by all sides. The directions which this trend may take, the consequences of advocacy for the handicapped and the rest of society, and the consequences of policies in response to such advocacy should be anticipated and carefully monitored.

DISCUSSION

In the past, handicapped citizens have constituted a large but silent minority within society. Drawn from all segments of society, having diverse problems, and being served by distinct segments of the larger service delivery system, the handicapped have not been a unified and identifiable interest group within the political arena. Instead, like many other minority groups, they have been denied fundamental rights granted to other citizens. Many handicapped persons have been excluded from public education, institutionalized without due process, denied equal opportunity in employment, and barred from public facilities by architectural barriers--in short, segregated from the mainstream of society and treated as second class citizens in many areas of life activity.

Within the last decade, however, some handicapped citizens have tried to correct this situation, establish for themselves the same rights to which others are entitled, and shift society's response to them from a philosophy of segregation to a philosophy of maximal integration within the mainstream. Like other minority groups before them, they are organizing as an identifiable group and utilizing the whole gamut of techniques traditionally used by other interest groups to effect social and political change--ranging from lobbying and voting to organized protests and the filing of court suits. Most recently, sit-in demonstrations in Washington and San Francisco culminated in the signing by Joseph Califano of the regulations pertaining to Section 405 of the 1973 Rehabilitation on Act. This section was perceived as a handicapped citizens' "bill of rights" and included provisions for affirmative action in hiring and guarantees of equal rights in such areas as access to public buildings and facilities. Largely in response to the advocacy efforts of the handicapped and their representatives, the trend in rehabilitation legislation and programming is now toward equal opportunity and integration within society.

It is difficult to predict the future course of this attempt by the handicapped to become a viable and powerful influence group. It is possible, if present trends continue, that the handicapped will become an increasingly solidified and powerful influence group if they continue to achieve their objectives. On the other hand, it is not unprecedented for a movement to capture the attention of the public early in its life but disintegrate later. In some respects, the women's movement is at such a juncture at present, for while the pioneering activists drew many persons to their positions, other persons were only alienated, and factions developed among segments of the population which stalled passage of the Equal Rights Admendment.

There are several reasons indicating that the handicapped may have more difficulty than many other minority groups solidifying as a coherent influence group. First, disability cuts across social and demographic lines, and the handicapped population is made up of rich and poor, black and white, male and female, young and old. Just on the basis of those demographic diversities, one would expect a variety of needs, interests, and political philosophies to be represented within the handicapped population. Secondly, while this project has identified many commonalities of need across disability group lines, there are still significant differences in need and perspective associated with disability groups. For example, while both the mentally handicapped and the physically handicapped are advocating equality of opportunity, the former are doing so primarily by focusing on such issues as the right to an education, the right to treatment, and voting, while the latter are emphasizing the issues which more directly affect their life function needs--for example, the removal of architectural barriers and access to public transportation. Finally, many handicapped citizens are not, like blacks or women, visible within society unless they choose to disclose their status as handicapped. In view of the stigma attached to disability, many disabled citizens have chosen to remain invisible and have even failed to use services provided for them in order to avoid being labelled and stigmatized. Thus, it is possible that many such persons will not choose to identify themselves with advocates and contribute their support to the growing consumer movement. The movement itself bears close monitoring. Information about the feelings of the handicapped population as a whole toward the activities of advocates and the causes which they are promoting is lacking.

This need for information becomes critical when one considers a second "unknown"--the extent to which the rise of the handicapped as a political influence group will have negative or positive consequences for the handicapped themselves and for society as a whole. First, it has always been difficult to assess whether a vocal, activist minority serves the best interests of the larger group it purports to represent. On the other hand, many groups have benefitted from the efforts of those who have promulgated their causes. It is likely that the majority of handicapped citizens are basically sympathetic with the causes currently being advocated--equal rights and integration (see chapter 5 of this volume and volume 3 for a discussion of preferences of the handicapped for integrated housing, for example). On the other hand, handicapped persons who are satisfied with the existing state or affairs, who wish to remain invisible within society, or who would have difficulty coping with a world in which they are a "political issue," may be negatively affected by the politicization of disability which advocacy may bring about. In addition, if radical factions within the advocacy movement develop, they may alienate other handicapped citizens and ultimately slow the progress of the handicapped population as whole by sidetracking the main issues. Negative consequences of advocacy for the handicapped themselves are difficult to predict, but can best be done on the basis of pollings of the handicapped.

Secondly, one must attempt to predict the consequences of the handicapped consumer movement for the nonhandicapped. This technology assessment has revealed that public attitudes toward the handicapped have traditionally been negative, often more than those toward ethnic groups, particularly if the disability is one which involves deviance from behavioral norms (see volume 4). Mixed with stigmatization have been attitudes of pity, sympathy, and concern, suggesting that nonhandicapped citizens are often ambivalent in their feelings toward the handicapped. Given this ambivalence, it becomes particuarly difficult to predict how members of the public will respond when they witness handicapped persons demonstrating and otherwise pressing for their rights. On the one hand, there is little question that simple, vivid demonstrations of the perspectives of the handicapped have opened many people's eyes--for example, when legislators have been asked to spend a day in a wheelchair and experience for themselves losses of functioning and self-esteem caused by architectural barriers. There is education value in advocacy. On the other hand, there is the latent danger of backlash, which may become especially acute if handicapped persons come to be perceived as "different from us" and as a disruptive element in society.

The third sub-issue within this issue is perhaps the most critical to policymakers. It concerns the effects on the handicapped and on the rest of society of policies adopted in response to the efforts of advocates of the handicapped. To date, the advocates have been effective in stimulating social and political change, as evidenced by the Education of All Handicapped Children Act, the Rehabilitation Act of 1973, and other developments at the federal, state, and local levels. At times, however, the solutions to problems incorporated in legislation and policy generate new problems. It is still debatable, for example, whether violent protests to school integration for blacks have been based on negative attitudes toward blacks--with opposition to court-ordered busing serving as a convenient means of disguising prejudice--or whether such protests have primarily been a reaction to the means used to achieve integration (namely, busing which is court-ordered). Affirmative action hiring policies are another case in which opposition to the means may be more vehement than opposition to the end--equal opportunity in employment. There is not sufficient evidence to permit judgment of the impacts of affirmative action policies directed at ethnic minority groups on employers, unions, and the general public. However, the possibility of backlash must be anticipated if backlash can ultimately polarize groups and pose an obstacle to the achievement of goals which the minority group, and policymakers on their behalf, sought to achieve.

The question is not whether the handicapped should or should not advocate their interests and use the traditional tools of political influence. Like other minority groups (like the National Rifle Association for that matter) they are participating in the democratic process in order to optimize their own benefits. If the self-advocacy movement continues to grow, it will simply mean that the handicapped will be in more direct competition with interest groups which have already established political power. What can be predicted in this situation is rhetoric on both sides, from the handicapped population and from other interest groups (for example, the airlines, the unions, teachers, etc.) who see their own interests compromised by efforts on behalf of the handicapped. The handicapped, rehabilitators, and policymakers should be alert to the paradoxes involved when disability and rehabilitation become politicized issues. One paradox is that while advocacy is a tool for achieving ends such as equal opportunity and integration, making one's group a visible and powerful force within the political arena often accentuates awareness of the differences between one's own group and other groups and carries the potential for creating polarization when the ultimate objective is minimization of differences and improvement of life functioning.

RECOMMENDATIONS

1. Research should be conducted to assess the preferences of the handicapped for proposed policies and programs designed to benefit them. Not only will this aid in determining the

extent to which vocal advocates accurately represent the interests of the majority of handicapped persons, but it will aid in anticipating which proposed policies or programs might fail due to their incompatibility with the avowed needs and interests of the handicapped.

2. At the same time, attention should be given to monitoring the attitudes of the public toward the handicapped and toward policies and programs on their behalf. This information would be valuable as a basis for anticipating negative reactions and backlash.

3. Where possible, and where information is available, policymakers might draw from the lessons of history pertaining to the course of other minority group movements and the effects of policies directed at those groups on the groups themselves and on society as a whole. While the handicapped are in many respects an atypical minority group, analogies to other groups may provide some guidance, at least with respect to policies which are likely to have major negative effects. Systematic assessment of anticipated consequences should be conducted before the policy is adopted and implemented. At present, for example, there is not an adequate data base to permit estimation of the financial consequences to the nation of making public facilities accessible to the handicapped, much less the social and attitudinal effects of this policy.

ISSUE 6: GROUPS AND INDIVIDUALS AFFECTED BY REHABILITATION

PROBLEM

Any rehabilitation program instituted will have effects and implications upon many individuals and groups other than those within the disabled population.

DISCUSSION

Programs and policies considered for adoption within society have a specific immediate aim. Many times there is a lack of consideration given to the further reaching effects and interactions that a program or policy will have with other variables of the total cultural system. In the case of rehabilitation programs, adoption can have major effects on many individuals and groups as indicated by the consequence analysis discussed in depth in chapter 6 and appendix C.

Sometimes the effects on persons other than the disabled are the most widespread impacts that programs will have. For example, a program aimed at employment of the disabled can have major effects on the families of the disabled, on other workers, on unions and other organizations, on employers, on insurance groups, on education and training organizations, etc. Therefore, it is imperative that the implications of any program on "affected individuals, groups, and organizations" receive full consideration during the policy formulation stage.

RECOMMENDATION

1. Procedural guidelines should be formulated for consideration of the effects of rehabilitation programs upon other than the disabled population for both the formulation and implementation of programs. Impact-statements, (for example) identifying affected individuals, groups, and organizations (modeled perhaps on environmental-impact-statements) should be undertaken.
2. More research into public attitudes toward the handicapped and attitude-change techniques is suggested. Some consequences shown in chapter 6 indicate that nondisabled members of society sometimes react negatively toward the handicapped or programs for them.
3. Program assessment or technology assessments should be performed prior to adoption of any new program.

MATCHING OF NEEDS AND PROGRAMS

ISSUE 7: RELATIONSHIP BETWEEN TECHNOLOGIES AND DISABILITY

PROBLEM

There is, at present, no centralized system for categorizing information about technologies used to meet the needs of the disabled; the degree to which each technology reduces incapacity in some life function cannot be reliably known.

DISCUSSION

All persons in society have limited capacities in one or more life functions, and technologies of any sort are successful to the extent that they increase capacity in some life function.

The analysis of rehabilitation technologies conducted for this project was significantly hindered by the lack of sources of information about the technologies available to meet life-function needs of the disabled. A search of the literature on each of the 14 representative disabilities has revealed that in none of these was there a comprehensive review by any author of all or even a large sample of the technologies available to meet the needs of persons in that disability group. The review of rehabilitation technologies in this report has been an attempt to impose some organization and order on a mass of loosely related data.

A system by which information about technologies can be collected is needed. Technologies which are specifically designed to increase the life-function capacity of a "disabled" person and those which are designed to increase the life-function capacity of nondisabled persons, can be uniformly described, classified and applied to persons in society whose capacity in a particular life function can be increased by that technology, regardless of the origin or etiology of the incapacity. This system could be invaluable in avoiding duplication of efforts. But more important, application of devices or products by groups or persons outside of the specific disability group for which the device has been developed would be promoted by such an information system.

RECOMMENDATIONS

1. A national clearinghouse for information about technologies and how they relate to the life function needs of the disabled population should be established.
2. Provisions should be made for the organization and training of personnel who can collect the data necessary to centralize available knowledge about technologies available to meet needs in specific life functioning areas.
3. Careful attention should be paid to policy alternatives which can act as incentives for, or barriers to, the flow of technological discoveries or products to those in need. Current policies should be reviewed, and proposed policy changes should be scrutinized to make certain that regulatory agencies, standards, and safeguards (whether applied to research or marketable products) provide adequate incentives to researchers and industry to develop, disseminate, and market new products or ideas with a minimum of lag time.
4. Standards and regulations which are deemed necessary should be judged by the principles of "minimum necessary." Regulations and the actions of regulatory agencies should be scrutinized to make certain that the regulations or actions do not hinder dissemination efforts by creating barriers to research, or adding unnecessarily to the cost of equipment or devices.
5. Central among information collected by clearinghouse activity should be benefit/cost data, both economic and social for all disabilities and technollgies. Necessary standards, regulations, and incentives can be accurately

judged only if this data is available for judging, program planning, and policymaking.

6. Research should be conducted to examine the process of diffusion of innovation as it pertains to the application and availability of rehabilitation technologies. The literature reviewed for this project has rarely included any information about the numbers of persons receiving various technologies. It is therefore a possibility, until research is conducted, that new technological development is not as much needed as the development of methods for putting technologies which have already been developed into wider circulation and use.

ISSUE 8: IDENTIFICATION OF HANDICAPS

PROBLEM

The identification of handicaps either with persons or with their environments, deserves close attention, because of the way the identification predisposes solutions to problems the handicap causes.

DISCUSSION

In general, solutions to problems depend on how problems are defined. The definition of a problem determines not only what is done about it, but also what is not done. The way a disability problem is defined determines whether rehabilitation will be attempted, and subsequently the method of rehabilitation. A definition depends on assumptions about the cause or problems, and where "correction of" problems of disability lies.

For a number of years, for example, persons confined to wheelchairs have had difficulty moving about the community, because of curbs, steps, narrow doors and hallways, and cars. The problem has traditionally been that the persons were required to be in the wheelchair. Persons could not climb stairs or curbs, or get in and out of cars because they had personal problems instead of an environmental problem. The course was therefore set for efforts at eliminating the handicap--building wheelchairs that could climb stairs. If the problem had been defined differently, the solution could have changed drastically. If the problem had been viewed as an environment full of barriers, the solution would have consequently been different. Since the advent of paved streets, high curbs or totally raised sidewalks have no longer been the necessity they had been. Buildings with ramps instead of steps might have been just as accessible for everyone. Many design concepts might no longer have been functionally necessary. For some years now, new structures might have been built in ways that prevented the costly re-modeling which is now seen to be necessary.

The sheltered-work movement provides another example of the importance of problem identification in relation to disability. Although the reasons for employing sheltered workshops for the retarded are very complex, a very strong underlying reason is that most retarded persons cannot be trained to function in competitive work situations. Thus, an environmental solution has been sought. Once this problem definition and problem solution became accepted, sheltered workshops became "the answer modus" to vocational rehabilitation of the retarded. New efforts, rather than being aimed at alternative solutions, were aimed at building better and bigger sheltered workshops. This example points to a problem identified with the environment when perhaps it should have been identified with impairment and technologies: the retarded may not function well in competitive work situations because they have not been trained to do so, and the training may have been missing because training technology is inadequate.

Problem identification and the resulting approaches to solutions have not been "all wrong" in the past, and they are not "all wrong" at the present. But approaches to problem solution (and policy regarding directions for rehabilitaton efforts) are determined by where the "responsibility" for the handicap is assigned.

RECOMMENDATIONS

1. Tried-and-true "loci" of handicaps associated with disability should be examined for validity and for alternative loci. Handicap is defined as the interaction of a disability with a particular environment (including rehabilitation technology) in which handicap occurs. A totally blind person is handicapped in trying to navigate an airline terminal if information is presented only visually, but in a dark room, a blind individual is not handicapped, even though the disability remains the same. Rehabilitation efforts based on this kind of rational assessment will show a much higher success since the root cause of problems will be attacked.
2. Rehabilitation technologies and programs should be developed only after definitive and exhaustive study of problem identification in handicapping situations.

ISSUE 9: INDIVIDUAL NEEDS IN RELATION TO PROGRAM GOALS

PROBLEM

The development of large programs in rehabilitation tend to categorize persons, slant services toward the lowest "common denominator," and place overemphasis on specific eligibility requirements.

DISCUSSION

In the administration of education and training rehabilitation programs, in contrast to providing individual services, the needs of individual clients can be sacrificed to the needs of program administration and regulation. These rehabilitation services are intended to help people in need.

If the needs of programs can outweigh the needs of the individual, rehabilitation efforts will be unjustified and vulnerable to critics.

When these programs are developed, there is a tendency to develop them for a certain "target population" based on disability. This procedure assumes that all persons included in the target population have the same needs, or that if differences are present they are quantitative rather than qualitative in nature. Programs conceptualized this way tend to categorize individuals into diagnostic groups, and tend to ignore individual differences which especially characterize the disabled. There are commonalities among persons, but programs aimed at commonalities are more likely to overlook, or minimize, individual needs than are programs aimed at meeting individual problems.

When specific disability based "target populations" are enrolled in programs, wide individual differences in need for the structure provided by services become readily apparent. The solution to this problem tends to be evolutionary in nature. As the program continues, there is a tendency away from the dictum of "minimum intervention necessary" toward one of "maximum structure possible." As differences between clients in a sheltered workshop, or in candidates for group homes become apparent--differences in the amount of program structure necessary, ability for independent choices, training needed, etc.--program structure tends toward providing for the lowest common denominator, or least capable client. This tendency reduces program complexity and reduces technical and training requirements of program administrators and staff members. The problems created by this tendency are often difficult to spot, because a program appears on the surface to be capable of providing for all levels of clients. However, the persons who lose the most from this situation are the ones who (at least theoretically) can easily gain the most.

The more capable clients, who may need a challenging experience in a sheltered workshop as preparation for entering competitive employment, may find instead that they are enrolled in a day-care program which offers little in the way of training and nothing in the way of challenge. Clients who need only minimal support services to live independently in the community (perhaps only a phone number to call when advice or help is needed) do not need a "group home" with 6-8 other individuals in the "target population," full-time house parents, visiting hours, fire-escape slides on every window, and all of the safety and regulatory accouterments of a community institution.

As programs are designed to meet the presumed common needs of a specific disability target population, emphasis is shifted from evaluation of the individual needs of clients to evaluation of clients to ascertain eligibility requirements for entry into existing programs. Scrutiny of individuals to see if they are in the specific disability population instead of scrutiny of programs to see if they are meeting the needs of individuals can become a case of the tail wagging the dog.

Eligibility regulations requiring that an individual needs all or even the majority of the services of a specific program should not prevent an individual from getting the help he needs. For example, some special-education programs require that a child be classified as mentally retarded before the child is eligible for services even though the child may only need help within a specific area and does not require all the special-education services designed for the mentally retarded.

RECOMMENDATIONS

1. Careful attention should be given to structuring rehabilitation policy which allows for flexible programming designed to meet individual life-functions needs of clients. While

this is difficult, it is neither impossible nor (necessarily) more costly. The greater numbers of clients who are acutally rehabilitated (rather than residing in rehabilitation programs) can alone justify this approach.

2. Emphasis should be placed on helping clients realize the maximum possible gain with the minimum intervention necessary.

3. The needs of the individual clients should be given top priority in an assessment of needs.

POLICY EMPHASIS

ISSUE 10: REHABILITATION POLICY EMPHASIS

PROBLEM

From historical beginnings in the rehabilitation of veterans to current civil-rights activities, rehabilitation technology may have been drastically hampered by limited goal-emphasis stressed in the policymaking arena.

DISCUSSION

The concept of life-function impairment provides a basis for the growth of technologies serving the disabled by enabling current service-delivery organizations to be of use. No large-scale maufacturer of consumer products can conscientiously "gear down" to serve the much smaller population of disabled persons. But every manufacturer of consumer products can (and for profit motive definitely will) consider adding consumers with life-functions needs to his present customer base.

The goals of rehabilitation can be coordinated with more widespread social goals. With the current necessity for mass transportation in urban areas, there is a need for vehicles with lift devices for shopping carts, and the same lift devices can serve the mobility-impaired disabled.

A simple element of language-and-life must always be considered very deeply by rehabilitation policymakers. Not only public attitudes but public capability and public usefulness are determined by names given technological devices. The nondisabled public and the disabled public can be served by conscientiously doing away with "segregrating" language and substituting more widely functional language. The Urban Mass Transit Authority can be beneficial to and popular among all persons in an integrated society without unnecessarily restrictive policies which segregate, frustrate, and inhibit maximum technological utility. Policymakers are in a very unique position in comparison to that of consumer-geared electronics firms and bus drivers: policymakers do determine to a much greater extent the language that becomes public policy and public reality and subsequently the uses of technology which serve the public welfare. (Minimizing the level of life-function impairment is a concept which axiomatically promotes public welfare for all groups in American society.)

In many ways, the substantive role of public policy in maintaining language which unnecessarily segregates disabled from non-disabled can be detrimental to nondisabled persons and to American society, as well as to persons with life-function impairments. When policy posits a group of persons as "disabled" and thereby grants persons within the group privileges, adverse reaction should not be unexpected from the unprivileged, "nondisabled" group. Affirmative-action guidelines, for example, may be perceived by some to segregate the persons with life-function impairments who are members of the "visible disabled" from persons both with and without such impairments who function outside of the "disabled" grouping. Policy language which forces employment of "the disabled," for example, establishes the disabled as a governmentally supported minority and gives official sanction to segregation that might not otherwise occur. Unprivileged "nondisabled workers" are predisposed to find fault with the "privileged" group, sometimes lowering the standard of performance which they have previously maintained. Reduction in productivity and general disenchantment of workforce members may be expected. The difficulty can be avoided by care in the formulation and use of policies which enforce "equal opportunity" for all members of American society.

The current state of technology appears to be a limiting factor in concommitantly employing the disabled productively and benefitting national production. Noteworthy is the fact that programs such as affirmative action guidelines require that persons socioculturally identified as "disabled" (visibly and demonstrably so) be employed. In such programs, no incentive is present for technology to advance to the point of solving life-function problems, even within the context of the job market in which functional evaluation is extremely traditional and perhaps essential. Unless public programs and policy begin to take into account the effects such enactments have on encouraging or discouraging technological solution to true problems in disability, the disabled, and rehabilitation, the level of problem-solving activity undertaken by technology will remain low. Programs and policies which provide for "the disabled" without providing for technological solutions to life-function problems should be viewed as stop-gap measures which treat merely the surface manifestations of disability. In some cases, such as cited above, programs and policies may discourage or delay actual solutions to the real-life problems of the disabled.

RECOMMENDATIONS

1. The goals of policies should be broadened to emphasize solving problems which affect both disabled and nondisabled.

2. The language used in the establishment of policy which does not segregate the disabled or cause politically based hostility by the nondisabled.
3. Goals should be matched with technologies available and should provide for development of technology within the total social and economic programs.

ISSUE 11: DISTINCTION BETWEEN REHABILITATION TECHNOLOGY AND MAINTENANCE

PROBLEM

Frequently there is confusion even in policymaking arenas, between rehabilitation technology and the total area of support provided the disabled, including income maintenance.

DISCUSSION

Distinction between programs of rehabilitation and other support are meaningful in the consideration and assessment of total programs for the disabled. Rehabilitation technologies are applied in order to overcome a disability with the goal of providing the disabled person with the ability to function within the community, the labor force, or both with independence. Supplementary security income (SSI), medicare, and other support programs are not directly related to rehabilitation technology. Table 7-1 shows the relative magnitude of rehabilitation expenditures and income maintenance expenditures over the years 1966 to 1974 from the Disability Insurance Trust Fund.

TABLE 7-1
CASH BENEFITS VS. REHABILITATION SERVICES WITHIN THE DISABLED INSURANCE THRUST FUND IN THOUSANDS (SOCIAL SECURITY BULLETIN, 1976)

Year	Cash Benefits	Rehabilitation Services
1966	1,721,133	1,493
1967	1,860,789	6,534
1968	2,088,352	15,393
1969	2,443,437	14,891
1970	2,778,118	16,489
1971	3,381,448	21,242
1972	4,045,895	27,523
1973	5,161,840	38,361
1974	6,158,569	49,670
1975	7,629,796	70,936

Lack of income-earning ability among some disabled persons makes them eligible for SSI and other relief measures, while their disability alone accounts for their potential use of rehabilitation technology. Relief measures are neither used by all disabled persons nor used by only disabled persons. Persons who qualify for transfer payments because of age, dependent children, unemployment, or other socially supported causes compose the majority of persons receiving governmental aid.

Distinction between these two types of programs should be made in order to clarify the level of current support by government provided for development and use of rehabilitation technology. Otherwise the costs of rehabilitation technology may be inflated, thus leading to erroneous conclusions of the extent of rehabilitation being provided and permitting no meaningful conclusions to be provided about the cost-effectiveness of rehabilitaton.

Not only are rehabilitation and support programs distinct from each other, but also they may have results which conflict with each other. Support programs may provide disincentives to acceptance of rehabilitation which could lead toward greater measures of vocational and social independence. Current policies of reducing or terminating welfare benefits as individuals begin to earn income do not motivate the handicapped to become independent.

RECOMMENDATIONS

1. Programs and funding provided specifically for rehabilitation of the disabled should be clearly differentiated from those providing maintenance support for broader segments of society which include the disabled, both through accounting and data gathering procedures and in the specification of program goals.
2. Rehabilitation programs should be charged with obtaining better and more adequate data relative to numbers of people rehabilitated, closures, costs of rehabilitation for attainment of certain level of life function, etc.
3. Rehabilitation and support programs should be closely linked by policies which positively reinforce progress toward rehabilitation and independence. Financial disincentives to acceptance of rehabilitation or entry into the labor force should be carefully eliminated from interactive rehabilitation and support programs.

SPECIFIC RECOMMENDATIONS FOR CONSIDERATION

As indicated in the introduction of this chapter, the broad issues discussed above are aimed at recommendations about rehabilitation policy which affects all rehabilitation programs. In this section of the chapter, recommendations about specific programs are considered. This discussion will hopefully lead to greater understanding of the total problem and yield more in depth information for policymakers to utilize in weighing alternatives.

These specific areas are Conceptual Organization and Administration of Programs, Political Influences and Impact, Matching of Needs and Programs, and Policy Emphasis. Specific considerations are listed within the first three areas. A more inclusive discussion of central consideration for policy emphasis is included in the last section.

CONCEPTUAL ORGANIZATION AND ADMINISTRATION OF PROGRAMS

- A sound dynamic model of the rehabilitation system should be developed to be utilized for analysis and prediction of the effects of new rehabilitation programs on the system and on society.
- Research, possibly a technology assessment, is needed to develop a "universal" and functional conceptual definition of impairment, disability, and handicap. Consideration should be given to developing causal classification or classifications by life-function needs.
- The consequences arising from the differences in conceptual and legal definitions of disability should be determined, and handicap relative to life functions in conjunction with rehabilitation technologies should also be determined.
- Standard procedures for determining the magnitude of "hidden or undetected" disabilities relating to onset and sources of disability should be determined to provide a general guide for developing appropriate technologies.
- The interrelationships of the various pieces of legislation concerning eligibility for services and consumer protection for those using the services should be determined. These determinations should not only evaluate potential adverse effects that may result from using the technologies but also the adverse effects that may result from prohibiting the use of technologies.
- Future censuses should give greater attention to the determination of data relative to the disabled population, especially with regard to demographics (such as age, sex,

minority groups, income level, and multiple disability) and possibly to information relative to the three or four major "handicaps" being experienced by the disabled individual.

- Studies and data gathering should be undertaken to determine incidences, mortality rates, etc. by age, sex, and other demographic factors.

POLITICAL INFLUENCE AND IMPACT

- Greater understanding of the rehabilitation problem, both from the standpoint of need and areas of greatest concern should be developed through delineation of needs required to overcome life-function handicaps.
- In the assessment of proposals voiced by a specific advocacy group, representatives of the group should be brought into the analysis function.
- Research to understand the impacts of considering the disabled as a "new minority group" in the context of present affirmative action requirements should be conducted.
- Future censuses should be include efforts to assess public attitude toward the handicapped.
- Upon the adoption of a new program, consideration of useful educational and promotional steps should be taken to apprise affected individuals, groups, and organizations of the intent and benefits of the program.
- If negative social reactions are anticipated when a new program is introduced, funding of new programs should include funds to prevent or minimize such reactions if they would otherwise have the potential for blocking intended benefits of the program.

MATCHING OF NEEDS AND PROGRAMS

- Research should be conducted to establish the relative weight of importance that could attached to the individual need statements within each life function based on analysis of the needs across disabilities.
- With the above analysis, consideration should be given to the probability of needs being

satisfied while at the same time consideration should be given to the impacts that would occur if the needs were to be satisfied independently of the means provided.

- Data should be collected relative to the benefit/cost of the various rehabilitation programs. This information should include both economic and social benefit/cost quantified in valid terms.
- Increased efforts be directed towards addressing those mobility needs that will enhance the capabilities of the disabled to "work with or on" or to "manipulate" the objects within the environment.
- Research should be conducted to analyze the relative importance of the various aspects, i.e., means, geographical location, etc., and specific program thrusts which can achieve the same program goals, e.g., delivery of goods and services to the individual versus providing transportation for the individual to the goods and services.
- A thorough study (possibly a technology assessment) of housing needs, technologies, and service delivery for the disabled should be undertaken (possibly by HUD, to consider coordination and interaction with all other housing programs).
- Rehabilitation agencies should be provided with incentive funds to establish pilot programs which utilize techniques which have been demonstrated in the laboratory setting but not employed in ongoing service programs. These include the use of task analysis, jigs and other adapted equipment and specialized teaching strategies, as well as support systems such as group homes which have been found to be effective with the severely and profoundly retarded.

CONSIDERATIONS FOR FUTURE POLICY EMPHASIS

CONCEPTS OF REHABILITATION AND MAINTENANCE

Life Adaptation

A lack of clarity in definition and in the relationship of rehabilitation to other programs directed at the handicapped is an issue with major implications for public policy directed at the handicapped. Throughout this project, rehabilitation has been considered to be a set of technologies and processes used for the purpose of improving the social well-being of the disabled by integrating them into society (and if possible, the workforce). This definition is consistent with the project's concept that improving life functioning leads to improved life outcomes. It is a definition which may differ in emphasis from that of the federal-state rehabilitation programs which historically have assigned primary emphasis on the goals of entry or reentry into the workforce, but which increasingly recognize the goal of improving self-care and social functioning or community integration as part of its mission. In this project, the scope of inquiry is broadened beyond vocational rehabilitation to include other programs whose objectives are to improve functioning of the handicapped in the broad sense. This broadened scope of functioning will be termed life adaptation.

Life adaptation is characterized by two generalized attributes: life function and life maintenance. Each member of the population possesses these attributes, but rarely to the same degree. While one thinks of these attributes as being intrinsic to the individual, society nevertheless attaches value to assuring its members minimal levels of life function and life maintenance. Indeed, our society chooses to devote a portion of its aggregate productive capacity to augmentation of either the life function or life maintenance of some of its members whose life adaptation attributes fall below minimal levels required for survival.

Society also attaches a value to ensuring equity for its members. In devoting part of the aggregate productive capacity of society to ensuring or augmenting intrinsic life function and life maintenance attributes of a portion of society's members, such augmentation must be equitable to those individuals from whom the productive capacity is derived; i.e., the augmentation must not significantly exceed what society collectively views as the lower limits of normal functioning. A principle of equity then requires that augmentation beyond the lower limits of normal functioning be derived not from the aggregate productive capacity of society, but rather from the intrinsic productive capacity of the individual possessing "normal" life adaptation attributes.

Rehabilitation

If rehabilitation means restoration of function, rehabilitated persons include those persons returned to their predisability levels of functioning, even if they perform previous functions through different means (as with the the aid of orthotic devices). One might define rehabilitation as attainment of some specified minimal level of functioning for survival, i.e., minimal life adaptation for survival.

If the goals of rehabilitation are set some what higher, the goal could be an increase in functioning to that level characterizing the lower limit of normal functioning for a member of the population. Setting no upper limit on the goals of rehabilitation, one might augment life functions beyond the normal range of functioning of an "un-rehabilitated" or nondisabled member of the population (e.g., through the use of bionics). Such goals of superior adaptation or enhancement of life function would clearly be in conflict with the principle of equity.

Maintenance

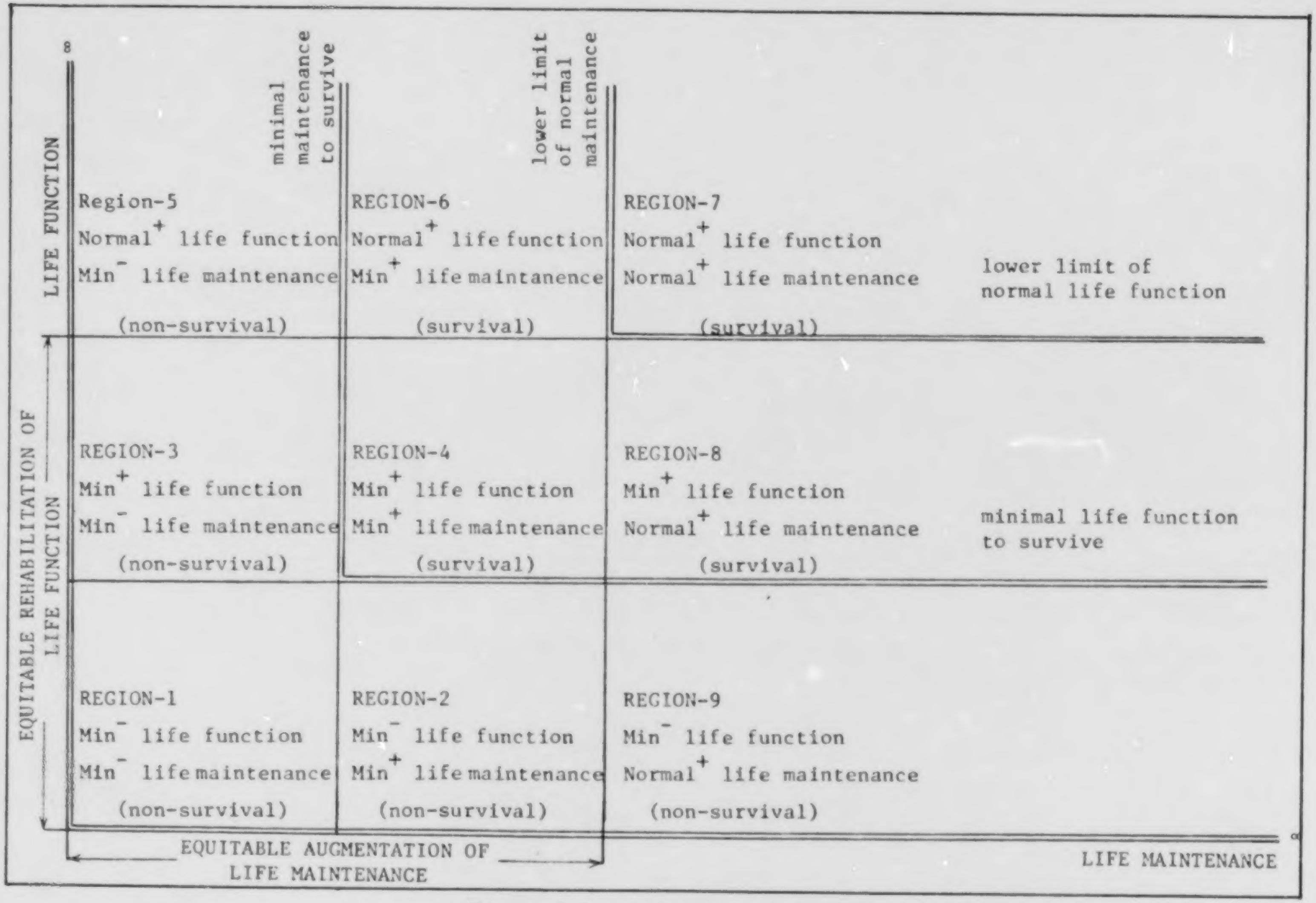
Distinct from rehabilitation is maintenance. Maintenance must be distinguished from the provision of direct rehabilitation services or the application of rehabilitation technologies. It can be defined as the support used by a person for necessities--food, clothing, shelter, and the like--and the ongoing expenses associated with maintaining life.

One might set the goal of maintenance as ensuring a specified minimal level of functioning for survival, i.e., minimal life adaptation for survival. One might set the goal of maintenance somewhat higher, to ensure life functioning at the level characterizing the lower normal limit of life maintenance for any member of the population. Setting no upper limit on the goal of maintenance, one might augment life maintenance beyond the range of normal maintenance of an "un-maintained" member of the population (e.g., through excess transfer payments). Such goals of superior maintenance would clearly be in conflict with the principle of equity.

A Concept of Rehabilitation, Maintenance, and Equity

The critical difference between the goal of rehabilitation and the goal of maintenance is that the goal of rehabilitation is the improvement of life functioning, while the goal of maintenance is sustaining a specific level of functioning. In economic terms rehabilitation, as well as improvement of life functions of any persons in society, can be viewed as a capital investment with potential for return, while maintenance can be viewed as an operating cost.

The interrelationship of rehabilitation, maintenance, and equity can be viewed as shown in figure 7-1. On the vertical axis, is portrayed the concept of life function. Two significant levels of life function are indicated: the minimal level of life function to assure survival, and the normal lower limit of life function for a member of the population. On the horizontal axis is portrayed the concept of life maintenance. Again, two significant levels of life maintenance are indicated: the minimal life maintenance to assure survival and the lower normal limit of life maintenance for a member of the population. A pair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LIFE FUNCTION
minimal maintenance to survive
lower limit of normal maintenance
Region-5
Normal+ life function
Min- life maintenance
(non-survival)
REGION-6
Normal+ life function
Min+ life maintanence
(survival)
REGION-7
Normal+ life function
Normal+ life maintenance
(survival)
lower limit of normal life function
REGION-3
Min+ life function
Min- life maintenance
(non-survival)
REGION-4
Min+ life function
Min+ life maintenance
(survival)
REGION-8
Min+ life function
Normal+ life maintenance
(survival)
minimal life function to survive
REGION-1
Min- life function
Min- life maintenance
(non-survival)
REGION-2
Min- life function
Min+ life maintenance
(non-survival)
REGION-9
Min- life function
Normal+ life maintenance
(non-survival)
EQUITABLE REHABILITATION OF LIFE FUNCTION
EQUITABLE AUGMENTATION OF LIFE MAINTENANCE
∞
LIFE MAINTENANCE

Figure 7-1. Life adaptation

of life function and life maintenance attributes specifies a point of life adaptation.

Currently the federal government is providing both rehabilitation and maintenance. While rehabilitation programs are aimed at persons having disability, maintenance programs are aimed at a broad range of disadvantaged persons, some of whom happen to be disabled. Rehabilitation and maintenance, despite some attempts at coordination, are essentially distinct and separate programs. In fact, an adult is no longer eligible for such benefits as SSI and SSDI if through rehabilitation efforts or otherwise the person becomes capable of earning more than a set monthly income.

Similarly, an individual with substantial income who becomes disabled, and who lacks catastrophic disability insurance, must exhaust his own maintenance resources before he becomes eligible for government maintenance and rehabilitation.

Each of the nine regions shown in figure 7-1 can be described with regard to society's policy for augmentation of life function and life maintenance of an individual's life adaptation attributes.

Region 1:

A person whose life adaptation attributes fall in region 1 would not possess either the life function or the life maintenance required to survive. Our culture forbids a policy that would leave life adaptation attributes in this region while society has a capability to augment the intrinsic life adaptation attributes. Region 1 is, in a sense, a forbidden region.

Region 2:

A person whose life adaptation attributes fall in region 2 would possess minimal life maintenance but lack the minimal life function to assure survival. Our culture forbids a policy that would leave life adaptation attributes in this region unchanged while society has a capability and willingness to change life function attributes. This also is a forbidden region.

Region 3:

These persons have sufficient life function, but insufficient life maintenance to assure survival. This is also a forbidden region.

Region 4:

These persons have the minimal life function and the minimal life maintenance to assure survival. While our society has a capability and a willingness to enhance life function and life maintenance to higher levels, considerations of equity permit a policy that would leave life adaptation attributes within this region. Significantly, it is within region 4 that the greatest opportunity for policy coordination of rehabilitation and maintenance occurs.

Region 5:

These persons possess at a minimum the lower limit of normal life function, yet they lack sufficient life maintenance to assure survival. Society does not support a policy that would leave a member's life adaptation attributes in this region. Thus region 5 is a forbidden region.

Region 6:

These persons possess at least the normal lower limit of life function, and the minimal life maintenance to assure survival. Society does permit a policy that would leave a member's intrinsic life adaptation attributes in this region (e.g., the working poor) or keep a member's life adaptation attributes from falling into a forbidden region (e.g., welfare).

Region 7:

Persons whose life adaptation attributes fall in region 7 possess at least the lower normal limit of life function and also the lower normal limit of life maintenance. They thus possess assurance of survival. Persons in this region possess the majority of the productivity capacity from which augmentations of life adaptation attributes is derived. Considerations of equity determine a policy of not augmenting life function or life maintenance of persons in region 7.

Region 8:

These persons possess at least the lower normal limit of life maintenance, but only minimal life function to assure survival. Persons in this region also contribute to the aggregate productive capacity from which augmentation of life function and life maintenance is derived. Society permits a policy that would leave a member's life adaptation attributes in this region and follows a policy of not augmenting life function while life maintenance exceeds the normal lower limit.

Region 9:

These persons possess at least the lower normal limit of life maintenance, but lack the minimal life function to assure survival. Persons in this region also contribute to the aggregate productive capacity from which augmentation of life function and life maintenance is derived. As with region 8, society follows a policy of not augmenting life function while life maintenance exceeds the normal lower limit. Region 9 is an especially interesting region, since its members are not assured survival until they have left the region by exhausting enough of their resources used for maintenance to fall below the normal maintenance limits. Region 9 raises serious questions of equity.

Equity

Four regions (4, 6, 7, and 8) of life adaptation assure survival either through intrinsic life adaptation attributes or through societal policies for augmentation of life function and life maintenance. Five regions (1, 2, 3, 5, and 9) do not assure survival. Society treats four of these non-survival regions (1, 2, 3, and 5) as forbidden regions and implements policies of augmentation of life function and life maintenance sufficient to avoid them. Only one of the non-survival regions (9) is treated differently. A person whose intrinsic attributes fall in region 9 must either exhaust sufficient resources used for maintenance to enter a forbidden region or else choose to expend maintenance resources for sufficient rehabilitation to enter a survival region; only then may society's policies act to assure survival.

Of the survival regions, equity plays an important role in societal policymaking. For example, enhancement of life functions of persons in region 6 would not be seen as equitable by persons in regions 7, 8, and 9 from whom the enhancement is derived, and who exhibit equal or worse life function. Enhancement of life maintenance of persons in regions 7, 8, and 9 would not be seen as equitable by others in regions 7, 8 and 9 with equal or worse life maintenance. Enhancement of life function and life maintenance of persons in region 4 might seem equitable to persons in region 7, but not to those in regions 8 and 9 of equal or worse life function. A person in region 6 who became disabled and moved to region 4 could equitably receive rehabilitation and maintenance augmentation while a person in region 7 who became disabled and fell to regions 8 or 9 could not. Persons falling to region 9 could not even be assured survival.

Thus a principle of equity is needed that ensures that a rehabilitation and maintenance policy is equitable with regard to those in other regions with equivalent or worse life function and life maintenance, from whom augmentation of life function and life maintenance is derived.

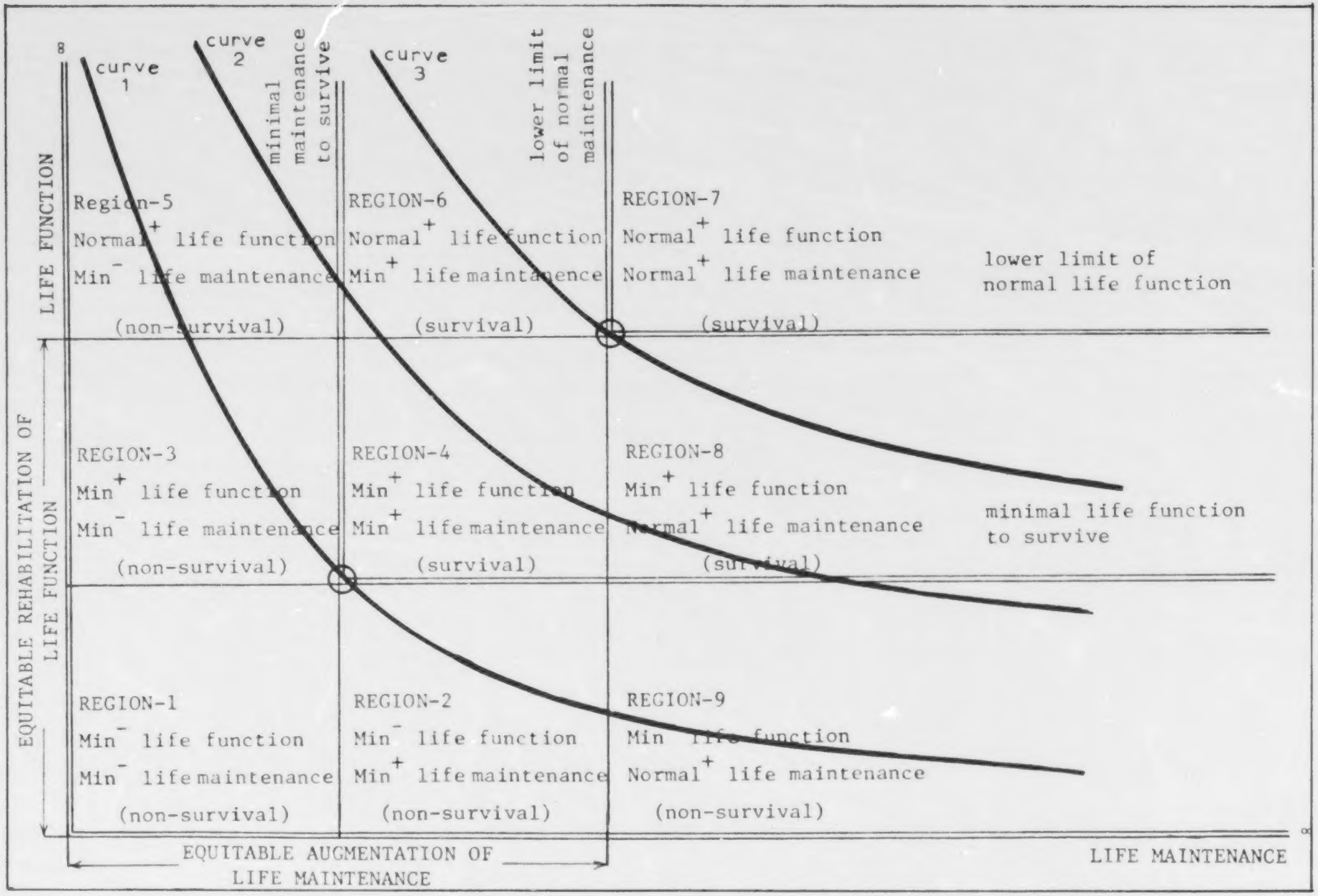
There is asymmetry between regions 5 and 9. Both are non-survival regions. Society supports a policy of promoting persons whose life-adaptation attributes place them in region 5 to region 6 by augmentation of life maintenance. Persons whose life adaptation attributes place them in region 9, however, are not promoted to region 8 (analogous to region 6). Society does not support a policy of augmentation of life function for these persons. With regard to life adaptation, those in region 9 are treated very differently from those in region 5.

Relationship of Rehabilitation and Maintenance

Figure 7-2 shows a concept of life adaptation. Several lines are shown superimposed on the previously identified regions. Each line represents combinations of life function and life maintenance that equip a person for survival. Were it not for the fact that some minimal life function and minimal life maintenance is required to ensure survival, curves of constant life adaptation would suggest that a loss of life function could always be compensated by an augmentation of life maintenance. Clearly, this is not true for all combinations of life function and life maintenance. Only those portions of life adaptation curves that fall in survival regions suggest feasible "tradeoffs" between life function and life maintenance.

The concept of a tradeoffs is problematic. By "tradeoff" we mean that to achieve a given goal of life adaptation one might choose to augment life function through rehabilitation, if possible. On the other hand, one might choose to augment life maintenance to compensate for the loss of life function, if possible. If both are possible, then to reach a given goal a feasible tradeoffs exists between rehabilitation as the method and life maintenance as the method.

With regard to rehabilitation and maintenance, a minimum goal is represented by sufficient augmentation of life function



curve 1
curve 2
minimal maintenance to survive
curve 3
lower limit of normal maintenance
LIFE FUNCTION
Region-5
Normal+ life function
Min- life maintenance
(non-survival)
REGION-6
Normal+ life function
Min+ life maintanence
(survival)
REGION-7
Normal+ life function
Normal+ life maintenance
(survival)
lower limit of normal life function
REGION-3
Min+ life function
Min- life maintenance
(non-survival)
REGION-4
Min+ life function
Min+ life maintenance
(survival)
REGION-8
Min+ life function
Normal+ life maintenance
(survival)
minimal life function to survive
REGION-1
Min- life function
Min- life maintenance
(non-survival)
REGION-2
Min- life function
Min+ life maintenance
(non-survival)
REGION-9
Min- life function
Normal+ life maintenance
(non-survival)
EQUITABLE REHABILITATION OF LIFE FUNCTION
EQUITABLE AUGMENTATION OF LIFE MAINTENANCE
LIFE MAINTENANCE
∞

Figure 7-2. Life adaptation goals

and life maintenance to intersect the lower left corner of region 4, a survival region. This is shown by curve 1. A maximum goal is represented by sufficient augmentation of life function and maintenance to intersect the upper right corner of region 4. This is represented by curve 3. Intermediate goals fall between the two extremes as represented by curve 2. Note that only within a survival region, for a goal of a given level of life adaptation, a feasible trade-off between rehabilitation and maintenance may be possible.

This is precisely what a person may face who moves from region 7 to region 9 due to a sudden disability along a line of existing maintenance, as shown by the line from point 1 to point 2 in figure 7-3. The individual must make the choice reducing his existing level of maintenance to purchase the rehabilitation he requires. Thus he might be able to pass along a line of constant life adaptation to point 3, a survival point. If he continues the "tradeoff", his level of maintenance may decline until he enters region 4 (point 4). Conceivably, if the tradeoff of maintenance for improving life function were possible and continued, he could find himself in region 6, rehabilitated to normal life function, but below normal life maintenance (point 9). As determined by society's policy, he may receive augmentation of life maintenance or life function in regions 4 and 6. Note as well the other paths that are indicative of potential life outcomes of this scenario of sudden disability of a person in region 7 (e.g., path 1, 2, 3, 4, 5; path 1, 2, 3, 4, 6, 9, 10, 11, etc.). Depending upon the augmentation and intrinsic adaptation, he might return to region 7 or 8, but more likely would become stabilized in region 4, 6, or 8.

Clearly society leaves the choice to the individual in regions 8 and 9 to exchange existing levels of life maintenance for an improvement in life function. It is within region 4 that society faces a choice between maintenance and rehabilitation

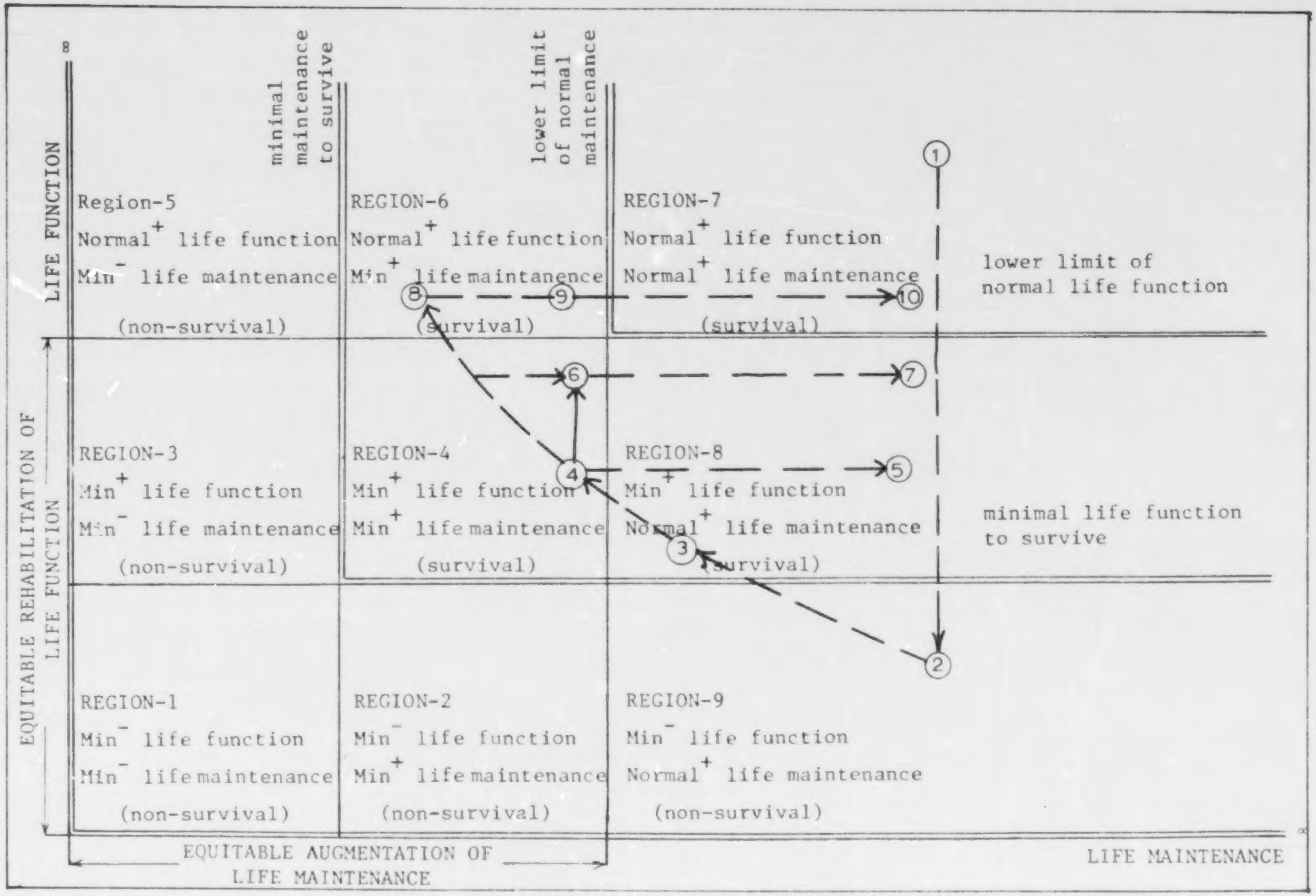

∞
LIFE FUNCTION
minimal maintenance to survive
lower limit of normal maintenance
①
Region-5
Normal+ life function
Min- life maintenance
(non-survival)
REGION-6
Normal+ life function
Min+ life maintanence
(survival)
REGION-7
Normal+ life function
Normal+ life maintenance
(survival)
lower limit of normal life function
⑧
⑨
⑩
⑥
⑦
④
⑤
③
②
REGION-3
Min+ life function
Min- life maintenance
(non-survival)
REGION-4
Min+ life function
Min+ life maintenance
(survival)
REGION-8
Min+ life function
Normal+ life maintenance
(survival)
minimal life function to survive
EQUITABLE REHABILITATION OF LIFE FUNCTION
REGION-1
Min- life function
Min- life maintenance
(non-survival)
REGION-2
Min- life function
Min+ life maintenance
(non-survival)
REGION-9
Min- life function
Normal+ life maintenance
(non-survival)
EQUITABLE AUGMENTATION OF LIFE MAINTENANCE
∞
LIFE MAINTENANCE

Figure 7-3. Relationship of rehabilitation and maintenance

to achieve a given goal of life adaptation. A crucial factor is that rehabilitation is preferable to maintenance, if rehabilitation is possible. The preference rests on the assumption that increased life function produces increased individual autonomy. In turn, autonomy contributes to a whole range of personally rewarding values and behavior.

Common sense about the issue of rehabilitation and maintenance points in the direction of considering rehabilitation and maintenance as complementary strategies. In fact, the two are combined in the concept of life adaptation attributes which produce a range of life outcomes. A heuristic model is proposed, then for region 4 to simplify the task of visualizing the interaction of rehabilitation and maintenance (see figure 7-4).

The underlying concept of this heuristic model is anologous to what economists refer to as a production function or more generally as indifference curves. Basically it is a working relationship between two variables. The relationship can be loosely characterized as a wide ranging set of "tradeoffs".

An additional consideration in the model is the notion of costs. Macro-level costs are frequently mixed bags of social, political, and economic considerations. In the context of a primarily microlevel heuristic model, the costs have been reduced to interval level data--money. Hence manipulation of variables in the model of region 4 results in a view of the relationships between rehabilitation and maintenance as a percentage of the lower limit of normal life function and a percentage of the lower limit of normal life maintenance, and coinciding costs. The expense for rehabilitation and for maintenance is in terms of total life cycle outlay.

Examples of Rehabilitation-Maintenance Tradeoff Models for Region 4

Individual-Dual Leg Amputee--a micro-level example:

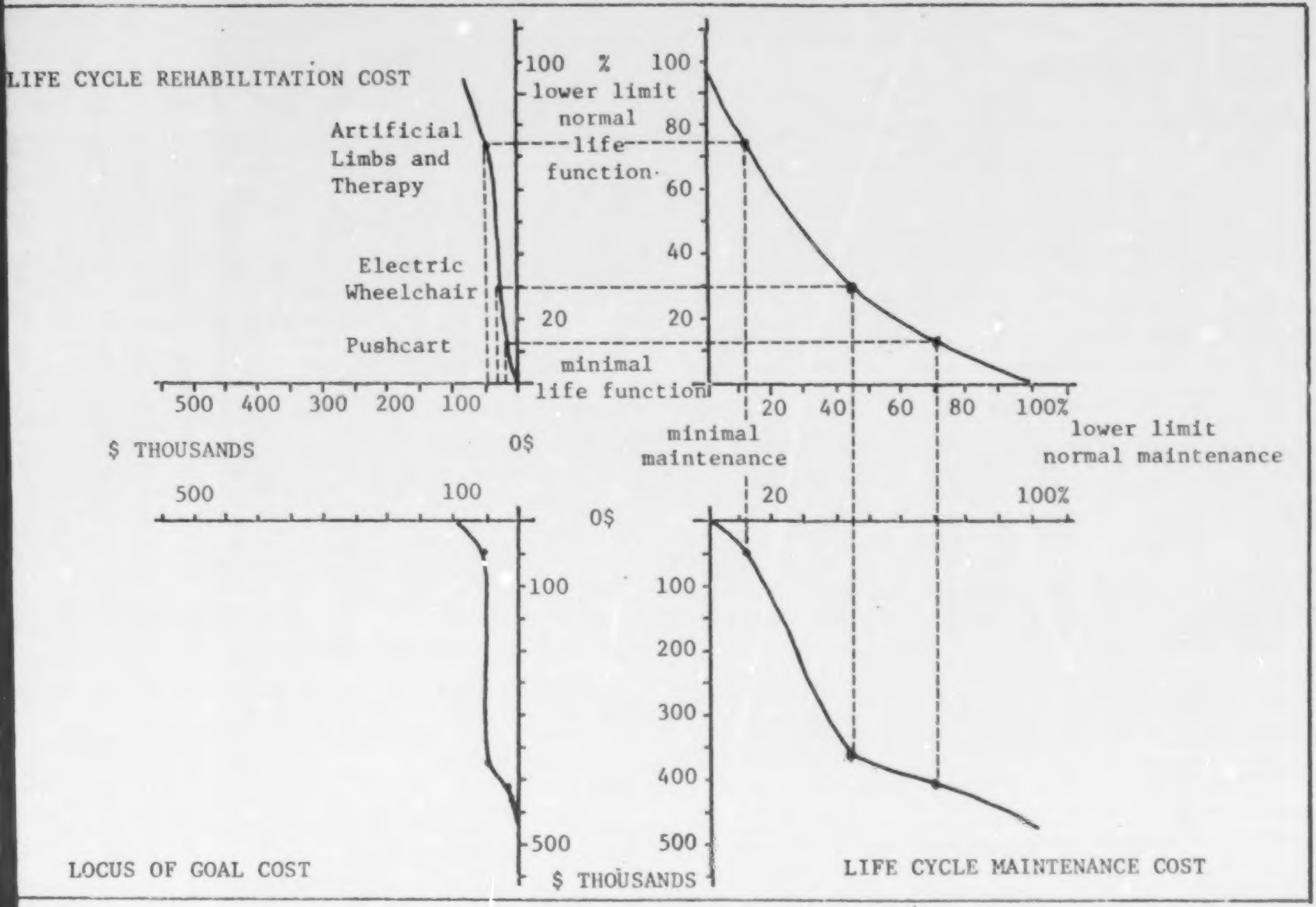


Figure 7-4. Micro-level dual leg amputee per individual per 30 years

A specific example is depicted in figure 7-4. The individual under consideration is a 30-year-old dual leg amputee. Region 4 of life adaptation is shown in the upper right portion of figure 7-4. Shown superimposed on region 4 are hypothetical lines of constant life adaptation. If the heavy line is taken as a goal, various combinations of life function and life maintenance are possible to achieve this goal of life adaptation. Clearly, either greater or lesser goals of life adaptation are possible. If a certain line of constant life adaptation is used, then a tradeoff of rehabilitation-of-life-function for augmentation-of-life-maintenance is possible. If no tradeoff is used, as when life function is augmented while keeping life maintenance constant, then new goals of life adaptation have been set.

There are various tradeoffs along one possible goal line of constant life adaptation. If the individual is provided with wheeled pushcarts at a life-cycle cost of $500, the person may regain 15 percent of the lower limit of normal mobility. To achieve the goal, the person may require augmentation to 70 percent of the lower limit of normal maintenance. This maintenance might consist of a live-in attendant, maid, and provision for special surface transportation. Such maintenance over a 30 year life expectancy is roughly estimated at $420,000. The aggregate goal cost is $420,500.

If the person is provided with electric wheelchairs at a life-cycle cost of $15,000, 30 percent of the lower limit of normal mobility may be achieved. This may still require augmentation to 45 percent of the lower limit of normal life maintenance to achieve the goal. This maintenance may only require a part-time attendant, maid service, and special surface transportation. The maintenance costs are roughly $360,000, with an aggregate goal cost of $375,000.

Finally, the individual is provided with artificial limbs and therapy. The person may regain 75 percent of the lower limit of normal mobility, at a life cycle rehabilitation cost of $45,000. The individual may still need augmentation to 10 percent of the lower limit of normal maintenance. The individual has considerable autonomy and may require only maid service and specially adapted automobiles at a life-cycle cost of $45,000. The aggregate goal cost is then $90,000.

Comparing these hypothetical tradeoffs to achieve a given goal of life adaptation produces the following goal costs:

	Rehabilitation	Maintenance	Goal Cost
1.	$500 (pushcart)	$420,000	$420,500
2.	$15,000 (electric wheelchair)	$360,000	$375,000
3.	$45,000 (limbs and therapy)	$ 45,000	$ 90,000

In this case the principle that rehabilitation is preferable to maintenance when possible is not only effective in terms of human values but also effective in terms of minimizing costs to achieve a specific goal of life adaptation. Figure 7-4 then depicts a micro-level tradeoff analysis to achieve a specific goal of life adaptation. The locus of goal costs for a specific life adaptation goal provides the coordinates of goal cost, whose sum is the aggregate goal cost. The locus of goal costs provides an excellent heuristic model for rehabilitation and maintenance. Note in Figure 7-4 the steepness of the locus. This suggests that small increments of rehabilitation are equivalent to large increments of maintenance, providing the rehabilitation technology exists.

Environmental change-transportation for 0.5 percent of the disabled population: a macro-level example:

The analysis of life adaptation goals can be applied to a specific program such as solving the problem of inter- and intra-community mobility for the disabled (primarily wheelchair bound persons). The rehabilitation technology of environmental change can be applied to make all transportation systems available to these disabled persons. An alternative is to trade off less adaptation of the transportation system for increased maintenance in the form of special transportation service, attendants, etc.

If 600,000 persons are involved, providing sufficient maintenance in the absence of adapted transportation to reach the life adaptation goal might require augmentation to 90 percent of the lower limit of normal maintenance, perhaps $2500 per person per year, for 30 years. Thus a life-cycle maintenance cost of $45 billion is roughly estimated. If all subway systems are adapted for wheelchair bound access, these persons might achieve 30 percent of the lower limit of normal access to transportation. This adaptation costs perhaps $30 billion over a 30 year life cycle. Still to achieve the indicated goal, 40 percent of the lower limit of normal life maintenance would be required. The aggregate cost would be $48 billion.

Finally, one could adapt all surface transportation of all types for access by the wheelchair bound. This might achieve 80 percent of the lower limit of normal access to inter- and intra-city transportation at a rough cost estimate of $120 billion over a 30 year life cycle. Still, augmented maintenance to 10 percent of the lower limit of normal maintenance would be required to reach the goal, costing perhaps $4 billion. The aggregate cost would be $124 billion.

Comparing these hypothetical tradeoffs to achieve a given goal of life adaptation produces the following representative costs.

	Rehabilitation	Maintenance	Goal Cost
1.	$0	$45 billions	$ 45 billions
2.	$18 billion (adapt all subways)	$30 billions	$ 48 billions
3.	$120 billion (adapt all transp.)	$ 4 billions	$124 billions

Figure 7-5 illustrates the macro-level tradeoff analysis to achieve a given goal of life adaptation. In this case, the principle that rehabilitation (i.e., adaptation of all

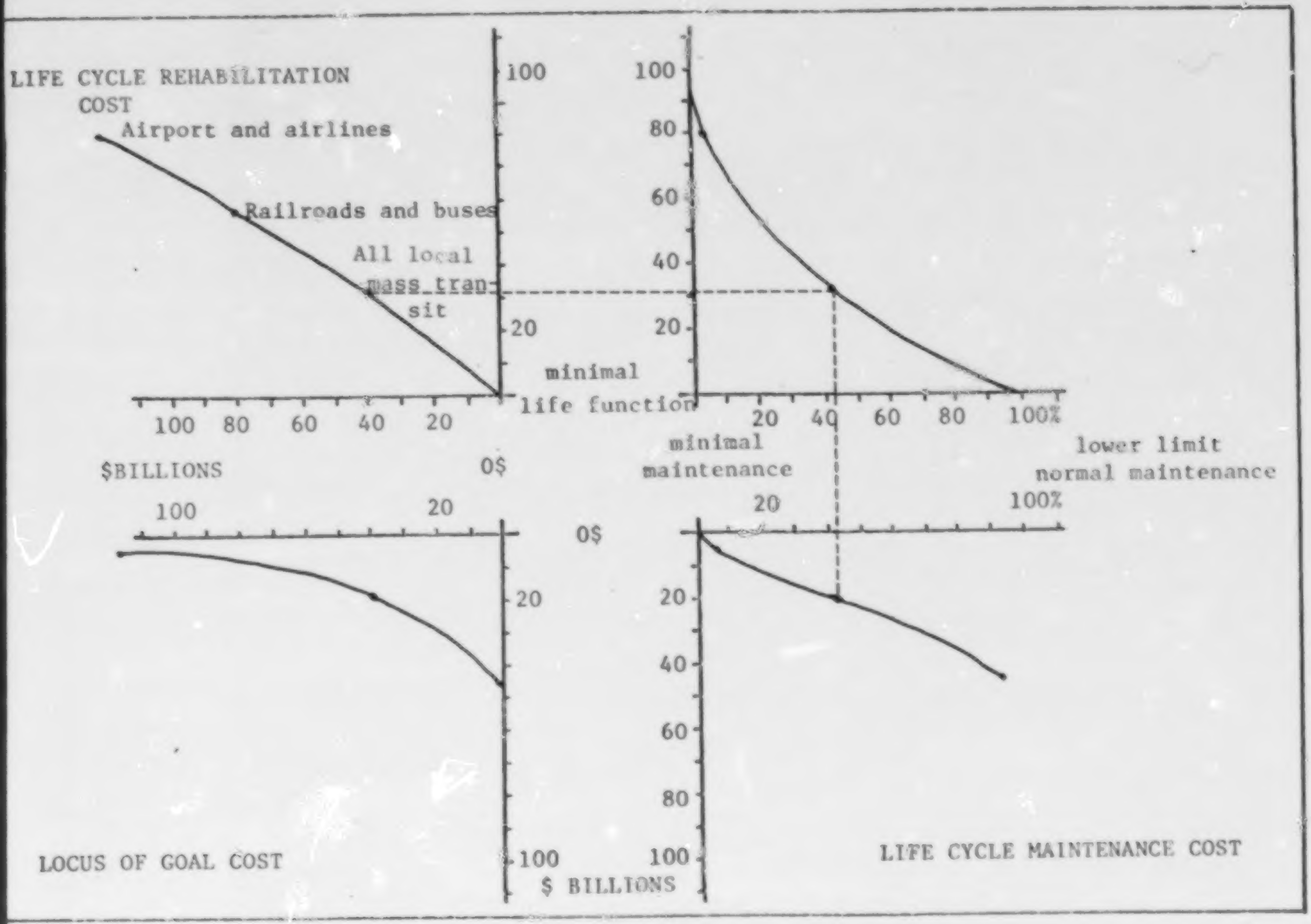


Figure 7-5. Macro-level, adaptation of transportation per 600,000 people

transportation) is preferable to maintenance if possible results in life-cycle costs many times that of maintenance alone or a mix of maintenance and rehabilitation. While rehabilitation to the maximum possible results in maximum personal autonomy, it also results in maximum costs. Thus, the principle of rehabilitation being preferable to maintenance when possible may not be feasible at a macro-level, even when desirable at a micro-level.

The locus of goal costs, a heuristic model of rehabilitation and maintenance indicates by its gradual slope, that relatively large expenditures for rehabilitation through adaptation of transportation will result in relatively small changes in the need for maintenance directed to the same goal of life adaptation.

Kidney Ailment-A Specific Disability Group--
macro-level example:

This specific case is shown in figure 7-6. The analysis follows that of the previous two examples, with one major difference: a technology is envisioned which does not yet exist, the artificial kidney. Thus only portions of any life-adaptation goal are realizable, those portions covered by existing rehabilitation technology to augment life functioning. While dialysis might achieve 45 percent of normal life function at a cost of $60 thousand, only one technology, that of kidney transplant, exists to achieve greater than 90 percent rehabilitation.* Significantly the locus of costs will be highly dependent upon the cost of the technology

goals and the state of rehabilitation technology to augment life function. The locus of costs to achieve a goal indicate both the direction of needed research and the point at which rehabilitation technology may be preferable to maintenance or vice versa.

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*No present technology exists between these two.

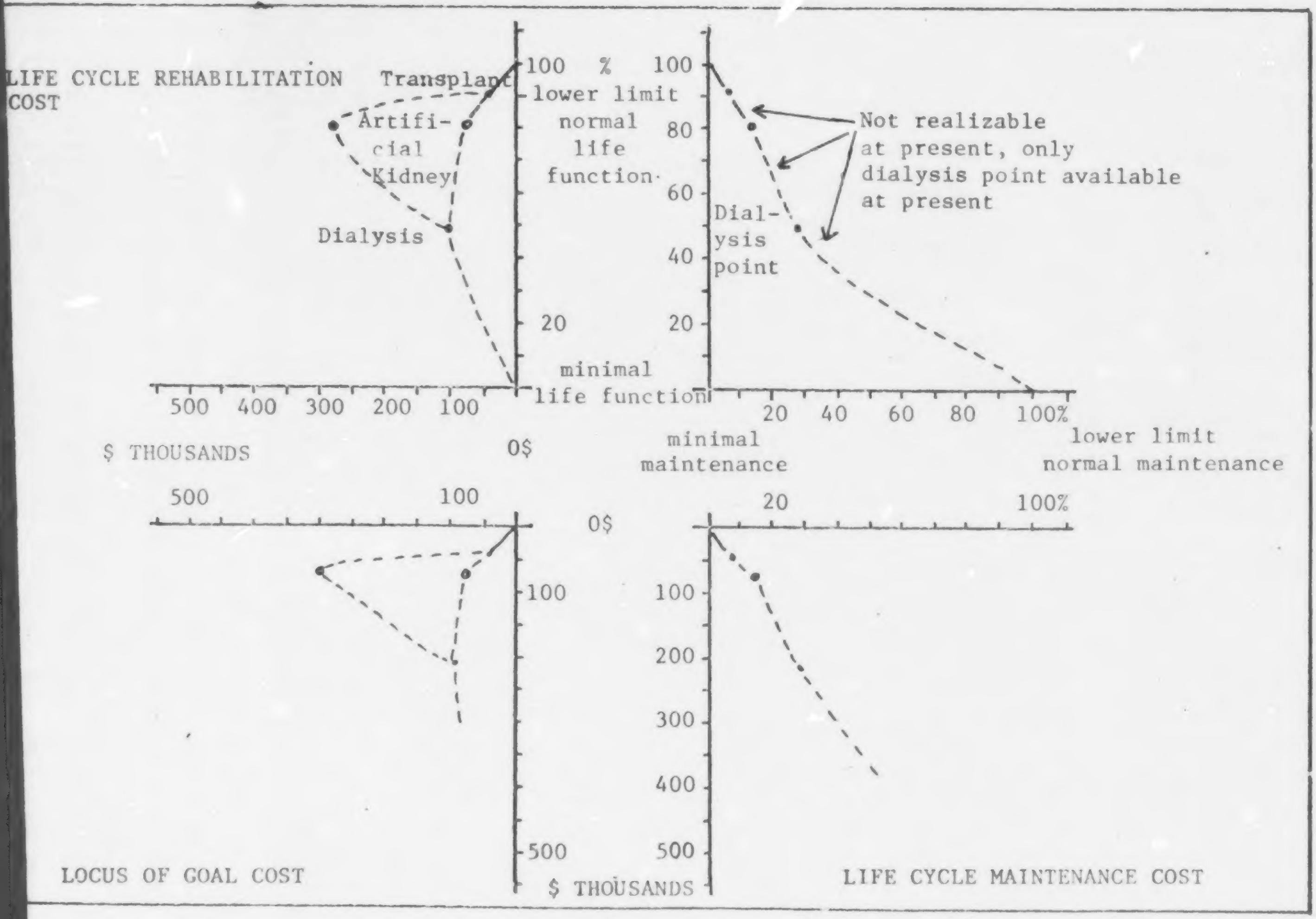


Figure 7-6 Kidney ailment a specific disability group per individual per 30 years

Welfare Policy and Life Maintenance Policy with Regard to Disabled Persons

Figure 7-7 illustrates two individuals of equal life-maintenance but differing by the fact that one is disabled and one is not. Note that each require equal increments of maintenance augmentation to reach the point of survival. They each receive an additional increment beyond the bare minimum to ensure survival. A significant issue is the cost of this additional increment. Clearly the cost of that increment is larger to reach the goal for the disabled person than it is for the nondisabled person. If one insists that the augmentation of life maintenance can be considered without regard to life function, then disabled persons can never achieve equity with the nondisabled person on welfare due to the extra cost of the increment to ensure survival.

Finally, a comparison of successful rehabilitation of the disabled with removal of a nondisabled from welfare is revealing. The overall cost saving is clearly greater for having rehabilitated a disabled person to region 7 or 8 than for removal of an individual from welfare due to the difference in incremental costs of achieving a given life adaptation goal.

Budget Policy with Regard to Rehabilitation and Maintenance

The heuristic model presented here is intended as a simple representation of the relationship between rehabilitation and maintenance in the form of a locus of goal costs. The simple concave shape of the locus A shown in Figure 7-8 suggests that a 45° budget line tangent to the locus would yield a minimum budget of 5 units to achieve a given life adaptation goal when both rehabilitation and maintenance are viable strategies.

The actual case is likely to be much more difficult to analyze as shown by locus B in Figure 7-8. There is insufficient data known about the characterization of real loci of goal costs. They are surely non-linear, and possibly

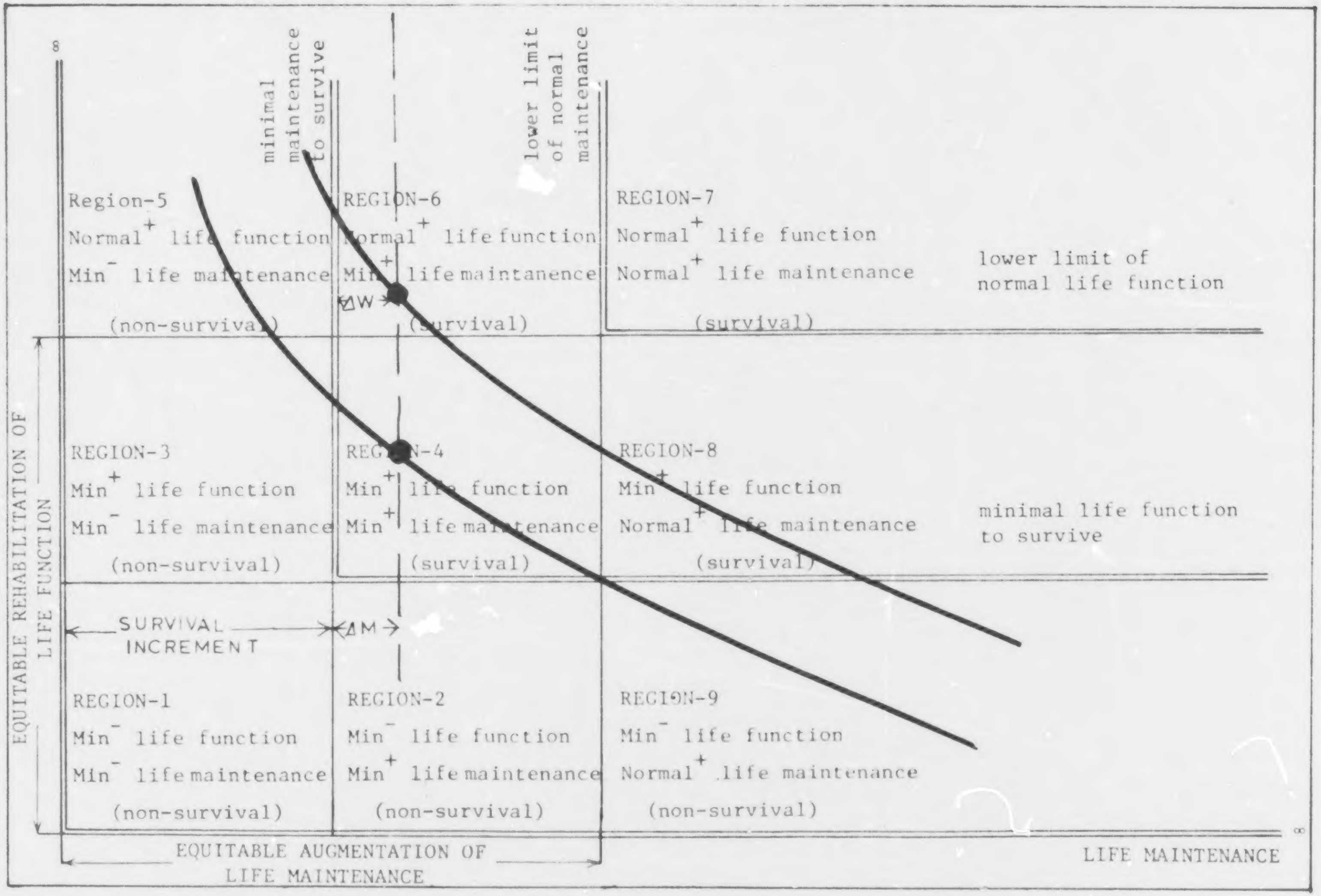

minimal maintenance to survive
lower limit of normal maintenance
Region-5
Normal+ life function
Min- life maintenance
(non-survival)
REGION-6
Normal+ life function
Min+ life maintanence
(survival)
REGION-7
Normal+ life function
Normal+ life maintenance
(survival)
lower limit of normal life function
ΔW
REGION-3
Min+ life function
Min- life maintenance
(non-survival)
REGION-4
Min+ life function
Min+ life maintenance
(survival)
REGION-8
Min+ life function
Normal+ life maintenance
(survival)
minimal life function to survive
SURVIVAL INCREMENT
ΔM
REGION-1
Min- life function
Min- life maintenance
(non-survival)
REGION-2
Min- life function
Min+ life maintenance
(non-survival)
REGION-9
Min- life function
Normal+ life maintenance
(non-survival)
EQUITABLE REHABILITATION OF LIFE FUNCTION
EQUITABLE AUGMENTATION OF LIFE MAINTENANCE
LIFE MAINTENANCE
∞
∞

Figure 7-7. Relationship of welfare policy to life maintenance policy for disabled persons

discontinuous as displayed in the three previous examples. Their shapes may result in no minima, a unique minima, or multiple minima as illustrated by locus B in figure 7-8.

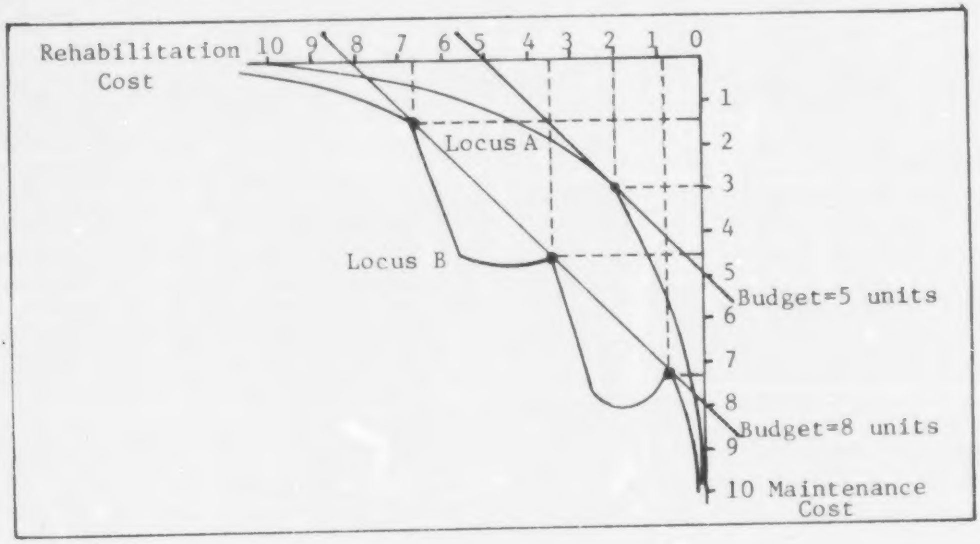


Figure 7-8. Fitting budgets to loci of goal costs

If multiple minima occur, then additional criteria for choosing a minimum will be needed; e.g., rehabilitation is preferable to maintenance if rehabilitation is possible. While the heuristic model helps to understand rehabilitation and maintenance, additional research into the nature of the locus of goal costs will be required prior to any attempt to apply optimization methods. It will also be necessary that additional analysis and research be focused on the definition and nature of life adaptation goals.

POPULATION AND REHABILITATION

Planning policy alternatives to meet rehabilitation and maintenance needs of a population yet unborn, or at least not yet in need of assistance, is perhaps one of the most difficult tasks of all. In spite of the nebulous character of the task there are a few useful reference points. Generally, population projections and assumptions hinge on two sets of factors (see figure 7-9). The first consists of fundamental demographic elements. The second relates to the general condition (well-being) of the population. The two sets of factors interact in reciprocal patterns of relationships.

A. Characteristics of the population or category

1. Size
2. Growth
3. Composition
4. Location

B. Conditions of well-being

1. Nutrition
2. Health
3. Employment
4. Leisure
5. Shelter
6. Education
7. Civic
8. Ecological

Source: Adapted from Gray and Bergman

Figure 7-9. Population factors

These factors will affect, to a significant extent, the prevalence of disability in certain groups. Essentially, the factors contribute to social-class related disabilities. More specifically, in the context of correlates of poverty, the lower classes are more likely to suffer more disability (in kind and frequency) than higher income groups.

Other major considerations in current attempts to project population figures involve the more straightfoward problems of overall growth and longevity. These latter two items will be dealt with after a discussion of social-class related disability projections.

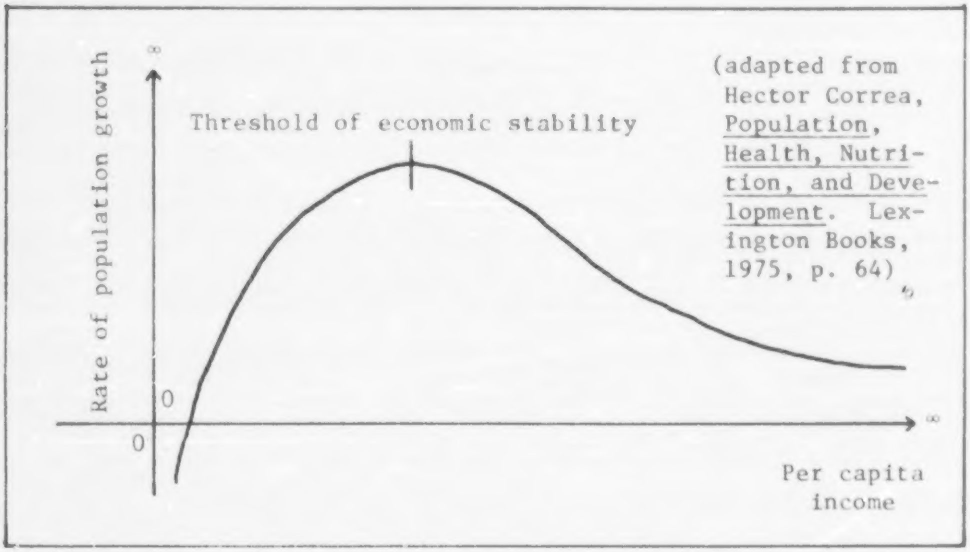
In light of the convincing data indicating a general, if not iron-clad, tendency for disability to accrue to the poor, growth projections for the lower strata take on inincreased importance. Perhaps one of the more useful analytic tools for assessing this problem area is one called the "differential fertility hypothesis.

Essentially, the hypothesis asserts that life circumstances and experiences will condition an individual's childbearing and child-raising behavior in terms of frequency and quality of life, respectively. This rather common-sense approach suggests, for example, that individuals raised in pathogenic circumstances stand a better than even chance of maintaining those conditions for their offspring. In other words, disability can be expected to remain relatively high in lower-strata segments of the population.

Of the large number of population studies cast in terms of the differential hypothesis the following findings are generally representative.

1. Urban born women tend to have fewer children than rural born women now living in cities.
2. The higher the occupational status of the father (and hence the entire family) the fewer children there will be per family.
3. Working women have fewer children than those who do not work.

Graphically, the relationship can be expressed using rate of population growth as a function of per capita income (see figure 7-10). Generally, the tendency expressed here is for middle income groups to produce fewer children. On the other side of the coin, however, is the tendency for poorer groups to produce more children. As indicated in chapter 3 of volume 1, there are more disabled among those children. The long run implication is a societal tendency to produce increased numbers of poverty level individuals. However, if anticipated improvements in overall level of public health materialize, the lower strata, in spite of its relative increase in size, may not produce disproportionately larger numbers of the disabled. In fact, the most optimistic scenario depicted in table 6-47 of volume IV, part B of this report indicates a gradual reduction in the overall disabled category to 9 percent of the total population. However, it should be noted that even though the medial scenario (second most optimistic) also shows a reduction to 10 percent of the total population, the lower scenario, showing the least optimistic trend, indicates an increase of the disabled to 20 percent of the total population.



(adapted from Hector Correa, Population, Health, Nutrition, and Development. Lexington Books, 1975, p. 64)

Figure 7-10. Population growth and per capita income

Currently, in the United States, estimates of the poverty level population are set at slightly more than 26 million. These figures amount to approximately 12 to 13 percent of the total population (Mauss and Wolfe, 1976).

Barring significant intervention by external forces, mainly other social policy thrusts, the overall size of the poverty-related-disabled population may be expected to increase. Based on representative findings in the area, specific increases in mental illness, mental retardation, and physically limiting birth defects may be expected.

In addition to social-class specific considerations there are the previously mentioned concerns of total population growth and longevity. According to data shown in chapter 6, volume 4, part B, of this report and data produced by the Population Reference Bureau, the United States population is estimated for the year 2000 to be approximately 260 to

265 million (Bovier, 1975). This estimate assumes an average completed family size of 2.1 children per woman, continued legal immigration of approximately 400,000 individuals per year, and continued improvements in the mortality rate. Based on this estimate, then, the country should experience approximately an 18.6 percent population increase by the turn of the century. Barring utopian levels of improvements in preventive medicine and equally significant levels of improvement in accident prevention, one can reasonably assume an approximate increase of at least 18 percent in the disabled population at large.

An alternative scenario to the 2.1 children per woman expectation should be addressed at this juncture. Although current data does not indicate any significant increase, the prime childbearing age cohort (20-30 years old) has the potential to produce a baby boom. The current 20-30 year old group is the product of the post World War II baby boom. If this group decides to ignore present economic conditions and produce between two and three children per family the total population could exceed 290 million by the turn of the century. This scenario would produce a population increase of 25.9 percent. Again, it is not unreasonable to assume a generally parallel, if not higher, increase in the number of the disabled population.

The final consideration to be addressed in this discussion is increased longevity. Two factors come to bear on the size of the elderly population. First, due to improved sanitation and public health more people survive the early years. This means that more people are able to have a chance to grow old. Second, and more important, elderly people are living longer with the aid of improved technologies. These life-extending technologies can be divided into four categories.

1. Technologies, such as dietary control or supplementation that alter cellular aging processes.

2. Technologies that alter aging of key organ systems.
3. Technologies that alter programmed aging, such as hormone-produced aging.
4. Tissue regeneration technologies.

An additional cateogry, organ replacement, also might be included as part of the "system" of life extending technologies. Even if the assumption is made that the life extending technologies will not dramatically alter age distributions until 2025, the absolute and relative number of older people in the population should still continue to increase. According to trends projected by the Bureau of the Census, the number of individuals 65 years old and older could run as high as 45 million by 2025. By 1980 the Bureau projects a total of 24 million elderly (65+), by 1990 there will be nearly 28 million, by 2000 there will be nearly 29 million, by 2010 nearly 31 million and by 2020 nearly 41 million. Toward the end of the last decade in this century the percentage of elderly will have increased from the current figure of 10 percent to a little more than 12 percent of the total population. By the year 2020 the avergae life expectancy (at birth) is expected to increase from 67.9 (current figure) to 69.9 for males and from 75.7 (current figure) to 78.0 for females (Bovier, 1975).

There is, however, the increasing possibility that the number of elderly individuals could be much larger than these projections indicate. So called life-span extending technologies which increase the maximum possible age may not be widespread until after 1990 (Gerjuoy and Gordon, 1976); however, technologies which increase the number of middle aged individuals who could live to extended old age are already being utilized.

The likely consequence of living longer is one of increasing life function restrictions. Disabilities affecting the aged run the gamut from restricted mobility to diminishing cognitive-intellectual capacity. In the long run, existing programs will have to be significantly expanded to accommodate the needs of the disabled elderly (see figure 7-11).

The relationships depicted in figure 7-11 are ones in which the mix of rehabilitation and maintenance required to preserve an individual's quality of life expectations must be periodically restructured. If, for example, in the most optimistic scenario the individual in question requires a heart pacemaker at age 25 $(A_{1(1)})$ he may, after the implant, be nearly restored to normal functioning, but require some maintenance. As the individual ages and requires additional upgrading of his heart-pacemaker system $(A_{2(1)})$ he may need extended maintenance support in order to preserve his original lifestyle. Finally, as the individual approaches age 65 and, again, needs rehabilitation (restoration) for his disability he will require a much larger outlay for maintenance in order to offset the combined effects of natural aging and heart trouble.

In the second scenario, $[A_{1(1)}, A_{2(2)}, A_{3(3)}]$, the individual is not fortunate enough to regain his previous level of functioning after the second implant. In cases of this sort the level of maintenance must be significantly increased just to preserve a minimal or, perhaps, less-than-normal level of functioning.

Program costs in this area will eventually far exceed the magnitude of welfare programs currently directed toward assisting the very young, e.g., AFDC (since the very young stand an increasingly better change to grow old in this society).

Also, for all individuals there probably is a point reached in the aging cycle when further rehabilitation expenditures would prove to be pointless. Policy consideration regarding the determination of that point, as far as public expenditures are concerned, is possibly one of the most sensitive areas to be faced.

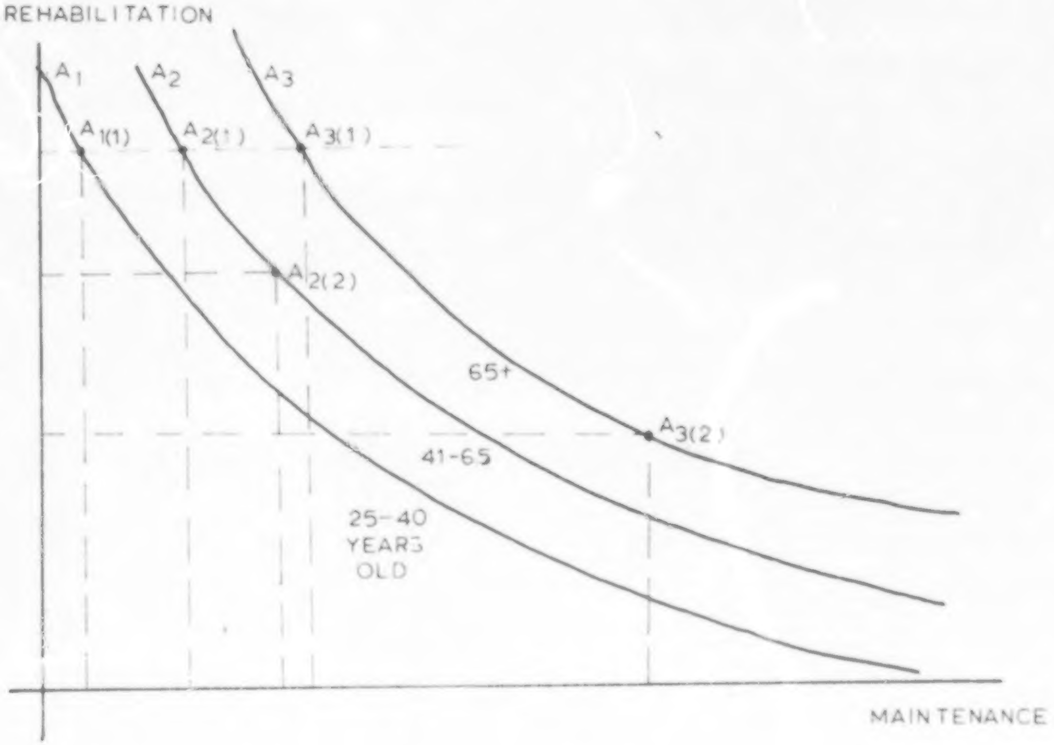


Figure 7-11. Age specific life adaptation curves

In summary, policy considerations should, at least, take into account the possibility that the ranks of the disabled could be expanded by a significantly increased elderly population. Moreover, disabilities unique to the aged may not be amenable to traditional rehabilitation strategies. Also, increases in the so-called social-class related disabilities should be allowed for (even though projections reported in table 6-57 in volume 4, part B do not indicate increases). Also, there is the possibility that some overlap could occur. Some of the disabled who were "products" of a deprived background will survive to old-age levels and will require sophisticated mixes of rehabilitation and maintenance. These cases will ultimately test the flexibility of policy alternatives.

COLLATERAL AREAS OF CONCERN TO REHABILITATION

Energy availability and economic growth, are, in themselves, suitable topics for separate technology assessments, and hence generally outside the scope of this report. They nonetheless require some brief discussion here. These two factors may eventually have profound impacts on the character of programs which relate to rehabilitation. Both could, in moments of significant decline, effectively reduce a wide range of services and opportunities currently available to the handicapped. They should be considered as factors that, along with other variables mentioned in this report, form the basic constraints within which rehabilitation technologies must be implemented.

ENERGY

In light of current accessibility demands made by the disabled, public transportation systems are making significant alterations in routing and entry-exit configurations. In order to accommodate the broad-based needs of individuals affected by mobility restricting disabilities, considerable outlays of money are being required. Although few systems are currently effectively utilized, the modifications are generally justified in terms of future needs.

If, however, (even assuming increased usage by the disabled) there is in the future a serious shortage of commonly used fuels, there would be a significant reduction in the utility of public transit systems and hence decreased effectiveness for the disabled. Moreover, the disabled, having become dependent on the public transit, could experience extreme dislocations in their lifestyles. They would, by definition, lack the flexibility to adapt to less accommodating forms of transportation. Even though public transit systems should probably enjoy fairly high priority status during an "energy crunch", they could possibly be cut back to levels of service which might exclude accessibility by the disabled, e.g., shorter and less accessible routes.

In another area of potential dislocation, energy intensive materials, e.g., ethylene based materials for prosthetic devices, etc., there should be some consideration giver to replacement materials. Technologies depending on these kinds of materials should be studied in the context of producing backup systems. In the event of serious energy shortages, materials earmarked for essentially low-production areas of life rehabilitation could be cut back.

In summary, both areas of energy-related technologies are quite vulnerable to short falls in fuel supply. Future policy alternatives probably should take into consideration the distinct possibilities of decreasing availability of energy supplies.

ECONOMIC GROWTH

Closely linked to energy availability is the consideration of future patterns of economic growth. Many projections currently indicate that the economic growth of the nation will continue to increase, but at a lower rate than in the past. At the same time, competing demands on the economic structure (public and private) are likely, if present trends hold, to increase. The net effect will be a set of circumstances which tend to reduce the capability and willingness of the system to support humanitarian programs like rehabilitation and maintenance.

As a result, there could be increasing social pressure from the nondisabled to move toward programs which provide the disabled with low life cycle cost services and opportunities. In the long run, such pressures could significantly shift priorities from more expensive maintenance strategies to what may appear to be or may actually be, cost-effective rehabilitation strategies. Moreover, strategies which may involve a mix of the two approaches could lose their effectiveness for the individual, if maintenance costs were made unavailable.

Lastly, planning for shifts in economic growth patterns should be couched in terms of most cost-effective life-cycle patterns for the disabled. The long-term implication centers around being able to provide at least moderate to minimal assistance to disabled individuals during times of serious economic dislocations or declines.

APPENDIX A

PROBLEMS IN IDENTIFYING THE NATURE AND SCOPE OF SPECIFIC DISABILITIES

Problems associated with disability and solutions associated with technology are not peculiar to American society or to the present age. Only recently, however, has disability been addressed by widespread social technology which attempts identification of the extent or prevalence of disability within our society. The Urban Institute, in a report on "comprehensive service needs study," summarized findings of major recent disability-prevalence studies examining members of the society within the age range 18 through 64 (Urban Institute, 1975). These findings appear in table A-1.

TABLE A-1
ESTIMATES OF THE DISABLED POPULATION OF WORKING AGE DERIVED FROM ALTERNATIVE SURVEYS BY DEGREE OF SEVERITY (IN MILLIONS)

	All Disabled			Disabled With Complete Work Disability		
	male	female	total	male	female	total
Survey of Disabled Adults (1966)	8.4	9.3	17.7	1.6	2.1	3.7
Census of Population (1970)	6.4	5.7	12.1	1.8	2.8	4.6
Health Interview Survey (1969-70)	3.3	4.3	7.6	1.8	0.6	2.5
Ohio State University Survey (1972)	4.6	7.4	12.0	2.5	4.5	7.0

Survey findings summarized in this table show that disabled individuals of working age account for between 7.6 and 17.3 percent of the total American population within the age group. Extrapolating from the Survey of Disabled Adults data, shown in table 3-1, the Urban Institute estimates that in 1975 disabled individuals of working age in society numbered 23.3 million persons and accounted for 18.7 percent of the population in the age group. Of the 23.3 million, 4.2 million are projected to be most severely disabled, 3.9 million are estimated to be severely disabled, and the remaining 15.2 million are projected to be partially disabled. These extrapolations account for most severe disability in 3.4 percent of the total population, severe disability in 3.1 percent of the population, and partial disability in 12.2 percent of the population.

Figures from one study which have been arrived at through extrapolation of earlier studies are, however, susceptible to error. The methods used to accumulate these figures are, nonetheless, perhaps accurate enough to generally depict the extent to which disability affects a large part of our society. Six-and-one-half-percent of the entire adult population, giving or taking a couple of percentage points for the grossest of survey errors, are either severely or most severely disabled. Such a figure is adequate to motivate large-scale humanitarian and political concern. Such a figure is also adequate to motivate a thorough look at the problem of gathering data about the extent of disability.

The information gathered for this project gives some indication of the identity of the disabled, but it also identifies tremendous problems in determining the accuracy of the figures arrived at. Information, for example, collected on the 14 specific disabilities studied indicates that these disabilities alone account for a best estimate of 20.4 percent of the population (within a probable range of 13 percent to 31 percent). Such factors as multiple handicaps and definitions of disability and severity of disability may account for both the best estimate and the range being high in relation to the Urban Institute estimate, but both the magnitude of the best estimate and the range of estimates indicate the necessity of considering sources of error data gathering.

ASSUMPTIONS FOR STUDY

Many judgments enter into the compilation of this study. First, estimates based on definitions of disability older and radically different from those used in most other studies were eliminated from consideration. This is necessary to identify a fairly "reasonable" low prevalence rate. "Best estimates" must of necessity be used to the central tendency of various figures, a tendency based on a particularly sound study or the figure most commonly cited and used in the field. This practice has been followed unless there is considerable evidence suggesting inaccuracy. Such inaccuracy is apparent in the data on mental retardation. The most commonly used prevalence figure for mental retardation is 3 percent of the general population, an estimate based on the normal distribution of intelligence test scores. Actual epidemiologic surveys contradict this figure, however. They indicate that while the 3 percent rate might be an accurate estimate for persons under age 18, 1.0 percent of the population is a more accurate estimate for persons 18 and older. Finally, when numbers of people affected have been considered as percentages of the total population of the United States, the total population as reported in the Census (approximately 180 million in 1960 and 203 million in 1970, whichever year is closest to the date of the prevalence study) is used as the basis, though this yields somewhat rough estimates.

The compilation of statistics about the 14 specific disabilities presented in chapter 2 provides an indication of the relative prevalences of the various disabilities.

However, it also raises some questions about the total prevalence of disability in the United States. If the various best-estimate rates are added for all 14 disabilities, for example, a total of 20.4 percent of the population would be disabled by the 14 disabilities studied in this project. The sum of the low figures is 13 percent, while the sum of the high figures is 31 percent. A large factor in the sum of the high figures is accounted for by hearing and visual impairments, of all severities, including the very mild. Individual "best estimates" indicate that almost 10 percent of the population has sensory disabilities. However, the interrelatedness of disabilities makes it inaccurate to strictly sum prevalence rates in this manner. Persons with one disability sometimes have other disabilities. Most estimates of the prevalence of a specific disability are based on all persons who have the disability in question, even if they have others, so that many multiply handicapped persons contribute to high prevalence rates for two or more conditions.

The 14 specific disabilities have been selected to represent a majority of the disabled population. Figures from chapter 2, in comparison to estimates cited in the Urban Institute report, show that they do so.

Although the scope of the problem of disability in terms of size of the population affected can be specified fairly well in some cases, present knowledge is inadequate for providing a solid basis for program planning or policy-making. Many of the following obstacles must be overcome in order to permit accurate prevalence determination.

VARIATIONS IN DEFINITIONS OF DISABILITY

The problem of variations in definitions of disability is present in both censuses of all disabled and the studies of specific disability groups. Virtually none of the individual disabilities studied in this project have been unambigously defined.

Definitional Problems

A few disabilities, particularly chronic diseases, are reasonably easy to identify; they are associated with organic involvements and symptoms which can be recognized through medical-examination technologies. Once the presence of coronary heart disease, emphysema, or diabetes, for example, is established, diagnoses might proceed to describe the degree of limitation or impairment. Other disabilities, most notably the behavioral disabilities of mental retardation and schizophrenia and the sensory impairments of vision and hearing, are essentially a matter of degree. The task of the diagnostician is to determine that a person deviates significantly from the norm with respect to intellectual functioning, behavioral pattern, ability to see, or ability to hear. The definitional problems in these cases are more severe since any number of cut-off points, all more or less arbitrary, can be set. However, none of the 14 disabilities studied is free of definitional problems. This can be best illustrated through a description of some of the problems encountered.

Confusion of Terms: Synonyms and Near Synonyms

The words "arthritis" and "rheumatism" are used loosely and often synonymously to refer to unexplained inflammation associated with aches and pains in the joints and muscles. While rheumatoid arthritis is more specifically defined, it is confused with polyarthritis--inflammation of several joints together--which is a broader diagnostic category. Rheumatoid arthritis is also called "atrophic arthritis," "chronic infectious arthritis," and "proliferative arthritis."

Stroke, as another example, is generally recognized as a neurological deficit or cerebral dysfunction caused by a disturbance of the blood supply to the brain. Yet in some cases, it is defined as the organic precipitating event (e.g., thrombosis or embolism, rupturing or closing an artery), while other times it is defined primarily in terms of the neurological results. Hence, the term "stroke" is often used synonymously with "apoplexy;" "'cerebrovascular accident,' 'embolism,' 'hemorrhage,' 'infarct,' or 'thrombosis;'" "hemiparesis" or "hemiplegia;" and so on.

Similarly, in labeling coronary heart disease, terms are used synonymously when they were not meant to be--terms such as "coronary artery disease," "atherosclerotic heart disease," "coronary atherosclerotic heart disease" and "ischemic heart disease." Although some investigators make crisp distinctions among terms, most use one or the other loosely.

For almost every one of the 14 individual disabilities studied, there are several alternative terms in use. Alteration of terms suggests a conceptual problem.

Difficulties in Standard and Functional Definitions

Emphysema is primarily defined as an anatomical disorder characterized by "an increase beyond the normal in the size of air spaces distal to the terminal bronchioles (of the lung) with destructive changes in their walls" (Baum, 1974). This is the accepted definition of the American Thoracic Society, the American Lung Association, and Dorland's Illustrated Medical Dictionary. However, since this definition specifies an anatomical defect which may not be apparent until a post-mortem autopsy, many professionals rely on clinical manifestations in diagnosis, and only then infer anatomical defect. The terms "chronic obstructive lung disease," "chronic bronchitis," or "chronic obstructive pulmonary disease" may be used. However, these terms based on clinical manifestation--primarily obstruction of the airways--are descriptive of the later stages of emphysema and do not define mild and moderate stages when obstruction of the airways is not yet present (Rodman and Sterling, 1969).

In the case of mental retardation, a generally agreed upon definition is that "mental retardation refers to significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period" (Grossman, 1973).

However, use of the definition is a problem. "Significantly subaverage general intellectual functioning" has been defined in terms of number of standard deviations below the mean on intelligence-quotient (IQ) tests, but since different tests yield different scores, cut-off points must be specified for each test. Additionally, intelligence test scores are influenced by a variety of factors other than "intelligence," so that test-taking behavior and conditions of testing add error to scores. (Specific difficulties, for example, have been encountered in obtaining accurate scores for minority group members when language or dialect differences, differences in cultural experiences, and psychological factors in the testing situation often depress scores.)

Because of the problems in obtaining valid IQ scores, a second criterion of mental retardation--deficits in adaptive behavior--was added to the definition. When measures of adaptive behavior are taken along with IQ test performance, many previously "retarded" persons, particularly those in minority groups, are no longer retarded because they are able to adapt to "standards of personal independence and social responsibility" expected of their age and cultural group (Mercer, 1973). This definition of adaptive behavior, however, is itself not very functional and subject to cultural bias.

The concept of adaptive behavior is in many ways similar to the concept of "normal" behavior or "sane" behavior used in identifying the mentally ill. In one study (Rosenhan, 1973), eight persons pretending to be patients presented themselves to mental hospitals and complained that they had been hearing voices. They were rapidly admitted, labeled as schizophrenic, and never detected as "pseudo-patients" even though they acted normally within the institutions. The study concluded that physicians operating with a medical model are more inclined to call a healthy person "sick" than to call a sick person "healthy." Nevertheless, more than any other disability, schizophrenia is a concept without reliable and valid functional definitions.

Levels of Definition and the Lack of Functional Definitions

Definitions of disabilities do not indicate the nature of the specific functional handicaps which the disabled person must live with, though some are more complete than others. The two major emphases in definitions have been nature of organic involvement and clinical manifestations. Several disabilities (notably coronary heart disease, emphysema, rheumatoid arthritis, diabetes, and cancer of the colon-rectum) are defined primarily in terms of organic involvement. That is, coronary heart disease is defined as obstruction or narrowing of the coronary arteries; emphysema as an increase in the size of air spaces in the lung tissue and destruction of air space walls; diabetes as a deficiency in the production of insulin in the pancreas; rheumatoid arthritis as a disease of the joints marked by inflammation and atrophy of tissue structures and rarefacation of the bone; and cancer of the colon-rectum as a carcinoma of particular types of cells. Definitions in terms of organic involvement do not indicate what the major problems associated with the condition are; they do not, for example, indicate that an emphysema patient has difficulty breathing or that the person with rheumatoid arthritis has difficulty moving the extremities without pain.

The next level of definition is more adequate in that it focuses on the major clinical manifestations or limitations associated with the condition. Thus, persons with spinal cord injuries, paraplegics, and quadraplegics are defined as paralyzed in specified extremities; patients with kidney disease are defined as having an impairment in the functioning of the kidneys which eventually can lead to renal failure; stroke victims are often defined in terms of neurological consequences; and so on.

In the case of epilepsy, definitions typically specify cause (abnormal electrical discharges of the brain cells) and primary symptom (seizures). The Epilepsy Foundation of America goes on to define seizures, but some argue that a large part of the symptomatology of epilepsy is not convulsive and that "epilepsy" and "convulsive disorder" should not be used synonymously (Boshes & Gibbs, 1972). While these authors may have had in mind other clinical or electroencephalographic manifestations, there is a larger problem with the emphasis on seizures. According to Connor, Hoover, Sands, Sternfeld, and Wolinsky (1975),

> . . . to limit attention to this single factor and not to discover or give the proper weight to the other variables that are associated with the disorder--variables that do not necessarily disappear when the seizures are eliminated--is to define incompletely the handicapping condition of epilepsy.

These authors had in mind not only such things as type of seizures and age at onset of seizures, but also other physical disabilities and psychological problems; in short, they point to something approaching a definition in terms of functional needs in life.

Some definitions in terms of clinical manifestations are more inclusive than others. For example, cerebral palsy is defined in terms of major impairments, age of onset, and etiology (pathology of the motor control centers of the brain). A definition by the United Cerebral Palsy Research and Education Foundation (1958) focuses on paralysis, weakness, and a lack of coordination as impairments of motor function; the definition, however, also adds that cerebral palsy may include "learning difficulties, psychological problems, sensory defects, convulsive and behavioral disorders of genetic origin." This definition, while vague in many ways, attempts to specify major areas of deficiency with respect not only to motor functioning but to other areas of functioning.

The closest approximations to a third-level, functional definition of disability appear with respect to hearing impairments. For example, degrees of impairment ranging from slight to extreme have been developed by the Illinois Commission on Children (1968). Each level of disability is defined in terms of decibel loss based on pure-tone testing and also in terms of functional impairment. Severe impairment means that loud voices about a foot from the ear can be heard, that the person can discriminate vowels but not all consonants, and that the child probably has a need for special-education services (including a full-time program for the deaf and a hearing aid).

Competition Among Definitions vs. Definitional Standardization

An issue quite distinct from confusion of terms includes the relative merits of having in use several competing definitions or one standard and widely accepted definition. Two sides of the issue are illustrated by analyzing definitions of visual impairment and hearing impairment.

In the case of hearing impairment, competition among definitions is active. There has been an attempt to define hearing loss in terms of a standard test using pure tone thresholds as standards. The American Standards Association (ASA) developed a set of reference thresholds in 1951, but in 1964 the International Standards Association (ISA), adopted revised competing reference thresholds. Now the ASA (renamed the American National Standards Institute) has switched to ISA reference thresholds, and as a result there is more consensus on criteria for hearing impairments ranging from slight to extreme.

However, many experts in the field argue that pure-tone testing alone is not adequate in defining a person as hearing impaired. Although there is more room for disagreement in setting criteria for hearing impairment than in setting criteria for its more severe form, deafness, the confusion even with respect to deafness is pronounced. Issues concern the following.

1. Whether a hearing loss must be permanent.
2. Whether etiology must enter into the definition.
3. Whether a particular portion of the auditory mechanism (e.g., sensorineural or conductive subsystems) must be affected.
4. Whether age at which deafness occurs must be taken into account.
5. Whether the identification should be limited to those who are mute as well as deaf.
6. Whether a hearing loss in one ear should qualify one as deaf.
7. Whether definitions should stipulate likelihoods of improving hearing through correction.
8. Whether a hearing loss beyond a single point on a continuum should be taken to signify deafness or whether all hearing losses should be described as degrees of impairment.
9. Whether speech-reception thresholds must be determined along with pure-tone thresholds.

Many of these points have been incorporated in classification systems. For example, most authorities distinguish among conductive losses (dysfunction in the outer or middle ear), sensorineural losses (nerve or central impairment), and mixed losses. Since many argue that definitions must describe functional ability to participate in oral communication or to hear everyday speech. A number of authors and organizations have developed functional definitions which incorporate some of the issues stated above. Different social institutions--for example, educational agencies, medicine, the military--have developed their own definitions for purposes of eligibility determination and diagnosis.

The obvious result of this degree of competition among definitions is a great deal of confusion about who is deaf or hearing impaired. A person might easily be considered to have hearing impairment by one social institution but not by another, or be considered hearing impaired at one stage in life but not later, or be classified as deaf despite an ability to participate in everyday conversation with corrective technologies.

While there is also disagreement as to how blindness and visual impairment should be defined, there is a legal definition of blindness which has enjoyed widespread acceptance and stands far above other competing definitions. The basic definition originated in 1934 with an American Medical Association meeting. As defined in the Social Security Act of 1967, it reads as follows.

> An individual shall be considered to be blind if he has a central visual acuity of 20/200 or less in the better eye with the use of a corrective lens. An eye which is accompanied by a limitation in the fields of vision such that the widest diameter of the visual field subtends an angle no greater than 20 degrees should be considered for the purposes of the first sentence of this subsection as having central visual acuity of 20/200 or less.

While the standard definition appears to be advantageous, it may not be beneficial at all. Classified within this definition of blindness are those who have no sense of vision as well as clients who have an impaired sense of vision. The definition fosters the assumption that all of the "blind" have the same needs. In addition, testing of vision based on the Snellen Visual Acuity Chart measures distance vision, when other aspects of vision such as near vision or uniformity of the visual field may have much more to do with reading ability and other important life functions. Even Snellen testing is unreliable if conditions of administration or interpretations of performance are altered.

While meeting the legal definition gains a person access to the service system for the blind, the imperfect correlation of the definition to functional need means that some who make it into the system do not need many services while others who fail to qualify could benefit from services for the blind.

Several difficulties have been identified by the Organization for Social and Technical Innovation, Incorporated (OSTI 1971). The Books for the Blind program of the Library of Congress excludes those with better than 20/200 visual acuity who nonetheless cannot read regular size print. The needs of the totally blind are not always addressed adequately when emphasis is placed on aids for those who have some remaining vision, nor are the special needs of the partially blind fully accounted for. Many persons are reluctant to avail themselves of services for the "blind" when they have some degree of vision and do not consider themselves blind or do not wish to assume that label.

In summary, definitional difficulties are apparent for both visual and hearing impairment. Without standardization of defintions, no one knows who is disabled. But a standardized definition may be as problemmatic as definitional chaos if the definition is not an accurate index of need for special services.

In most rehabilitation fields, many attempts have been made to improve definitions of disability, but in many ways, it appears that unambiguous definition, while possible, is not always practical. What may be more important is the effort to develop classification systems based on functional needs for service so that any individual is not just blind or deaf but a person with a particular nexus of needs in daily living and a particular nexus of service needs.

METHODOLOGICAL DIFFERENCES

Not only are studies carried out at different points in time and in different locales, but their basic methodologies differ considerably--all the way from inferential estimates (e.g., the estimation of the prevalence of mental retardation on the basis of the normal curve distribution) to mail surveys, to door-to-door canvases, to analysis of patient records, to actual screening or testing of samples of the general population.

HIDDEN OR UNDETECTED DISABILITIES

In many instances, researchers have attempted to estimate numbers of persons who do not identify themselves as disabled or do not seek and receive special services. Chapter 2 shows that epilepsy has a relatively low prevalence based on survey results. But many epileptics attempt to conceal their condition, and diagnosis of epilepsy is not reportable in most states. Although it is likely that many of the undetected cases are mild, one must be concerned with "latent" cases. The Epilepsy Foundation of America's (1975) conclusion is that at least 2 percent of the population suffer from "the commonly recognized forms of epilepsy plus numerous other, often unidentified, epileptiform manifestations." In other cases as well, detection is difficult. Joint biopsies cannot be conducted in field studies of rheumatoid arthritis; lung structure cannot be examined to decide unambiguously whether a person has emphysema or some other pulmonary difficulty. Yet estimation of unknown, undetected, hidden, or latent cases is likely to be much less reliable than estimation of known cases, and some figures, particularly those of voluntary organizations may be inflated.

VARIATIONS DUE TO ONSET AND COURSE OF DISABILITY

The problems in estimating prevalence vary considerably according to the type of disability in question. For cancer and other disabilities with acute onsets and high mortality rates, the most useful statistics are those concerning annual incidence and mortality rates. The prevalence rate does not fully indicate the scope of the problem. For developmental disabilities, figures concerning live births can be used in conjunction with surveys of disabled persons surviving at various age levels. In the case of schizophrenia, where onset is gradual and where a person may enter, leave, and reenter the service system repeatedly, estimation becomes very complex and has its own peculiar methodologies.

LACK OF NATIONAL DATA GATHERING

Although the census types of surveys are useful, there is not an institutionalized periodic, national survey which examines in detail the occurrence of specific disabilities and their combinations in multiply handicapped individuals. This might be the only solution to the problem of multiple accounting.

THE USE OF DISABILITY INFORMATION IN THIS PROJECT

Disability, it is clear, is currently depicted from widely varying perspectives for widely varying purposes. For example, many of the definitions of various disabilities and much of the information available about them have been the work of private special-interest organizations such as the National Society for the Prevention of Blindness and the United Cerebral Palsy Research and Education Foundation. Because such organizations must compete with other interests not only for a share of public recognition but for a share of both public and private financial support, the information they have gathered has often been narrow in scope and purpose. Other organizations, particularly those within state and national government, have been concerned with collecting information to be used in establishing cut-off points for income maintenance or service delivery and have sometimes also been competing for funding. Still others have been interested in collecting information strictly for medical use.

Assembling a comprehensive and useful picture of disability from the information currently available, consequently, is a bit like trying to assemble a jigsaw puzzle from mismatched and non-interlocking pieces. Clearly, there is a need for a single, unified concept on the basis of which information about disability as a whole might be collected so that the pieces of information obtained would "fit together" in a comprehensive and comprehensible picture. For such a purpose, a description of disability in terms of limitations in specific types of functioning offers many advantages.

Rehabilitation technology, including social services, specific therapeutic devices and techniques, and environmental change, is a tool for effecting specific types of change in the functional limitations of disabled persons. If the tool is to be wisely applied, policymakers must, above all, begin their formulations with as thorough a knowledge as possible of what the specific areas of need are. The principle is much like one psychologists and teachers use in effecting change within individuals. They areaware that they have little chance of successfully applying their respective technological tools of maximum usefulness.

The life-functions concept which is used to organize information about disability for this project provides a means for policymakers not only to identify specific areas of functional need but to readily comprehend differences and similarities among needs throughout the spectrum of disability as a whole.

APPENDIX B
NOTES ON GATHERING INFORMATION ON TECHNOLOGIES

The original plan for collecting data for this project entailed a preliminary search of the literature to identify pertinent specific technologies within the disability, locate individuals with expertise in rehabilitation technologies, and identify advocate organizations specific to the disabilities to be studies. Questionnaires were mailed to organizations where work involved the 14 representative disabilities. These questionnaires contained a wide range of questions on prevalence and incidence figures, numbers and types of different technologies and programs, number of disabled served by specific programs, and new or promising technologies. These questionnaires met with very limited success. Most organizations representing various disability groups were not prepared to respond to the questionnaire either because they did not have an integrated system of information about the needs, life functions affected, and number and variety of technologies and programs being applied for that particular disability, or they expressed a lack of willingness to participate. It is this last point which bears some careful consideration because it points to one of the major problems in developing an information system of the type attempted in this project--a quasi-adversary system in now being used to secure allocation of resources and to compete for legislative advantages among various disability-representative agencies. The prevailing attitude seems to be, "We look out for our own because if 'they' get theirs, we may not get ours." This competition among disability groups for public and private funds and legislative support mitigates against cooperation in projects such as this technology assessment, and leads to other problems such as inflated prevalence figures. Surveying national organizations which speak for the disabilities is not a particularly fruitful approach to gathering data on technologies.

The method decided upon for completion of this portion of the study was a search of the literature of the 14 disabilities for technologies. This approach is, of course, extremely limiting. For the technologies to be surveyed, they must be represented in the literature, an occurrence which is determined only in small part by the fact that the technology exists. It must be written about, and published in a source with a reasonable probability of being surveyed. A technology may be sighted in the literature if it is developed or utilized by persons who are not prolific publishers, or it may be overly represented if developed or used in an environment subject to publish-or-perish dicta.

PROBLEMS IN THE INTERPRETATION OF DATA

Difficulties encountered in the literature point to limitations in the interpretation of the data collected. The difficulties are as follows.

1. Representation of technologies in the literature is affected by many factors other than the presence or absence of the technology or program.
2. Defining is itself a problem. Alterations in the design of technologies may constitute new technologies, or they may not. There are a large number of different hearing aids available, for example, which use different methods of operation, and there are a wide variety of surgical techniques (bearing the name of the innovator) for the correction of a specific problem. In contrast, technologies or programs may have had wide application to many disabilities and many problems, but go by a single name which is not associated with any given disability. In this category are such technologies as psychotherapy and special education. Within these technologies are a myriad of other technologies, which are seldom, if ever, discussed. These technologies also have specific adaptation when applied to different disabilities, but are not identified by specific innovator names, or brand names as are hearing devices or surgical techniques. Even with efforts to keep technologies at approximately

the same level of definition, the listings cannot be weighted to reflect the real impact of the technology in terms of the number served or the amount of dysfunction alleviated.

3. The literature on some disabilities is more advanced, and much more multidisciplinary--as in the case of schizophrenia as opposed to cancer of colon/rectum (which is discussed almost exclusively in medical literature)--than literature on other disabilities. The number of technologies in some cases therefore reflects the quality and diversity of the literature from which researchers could draw. Differences in research style among the literature reviewers, and differential familiarity with different disability areas also biased results; some areas were more heavily researched than others when the research was conducted by personnel more knowledgeable of either the technologies or the disabilities.

APPENDIX C
SUMMARIZED RESULTS FROM WORK SESSIONS

Four parallel work-sessions examined issues in the four basic technology areas. A summarized description of the main findings of each work session is presented below. A longer and more detailed description of the deliberations of each work session is provided in volume V of this report.

Using program-thrust trees, each work session chose a "program thrust" from the tree and then deliberated upon that program thrust using the previously developed methodology. Most of the work sessions were able to consider in detail two program thrusts within the time that was allotted (4 days). The results of each program-thrust consequence analysis are briefly summarized in the following categorical sequence:

- °Target Population
- °Strategies (for program thrust achievement)
- °Axioms and Assumptions
- °Objectives and Performance Requirements
- °Implementation Requirements
- °Life-Function Analysis
- °Affected Individuals, Groups, and Organizations
- °Group Discussion Consequences
- °Hierarchical and Interrelationship Analysis
- °Computer-Generated Consequences
- °Implications for Programs

In each section entitled "Hierarchical and Interrelationship Analysis," a causal model is briefly described. Detailed results of using GSIM models are described in volume VI of this report.

RESULTS FROM THE ENVIRONMENTAL-CHANGE WORK SESSION

The environmental-change panel considered two program thrusts, as depicted on the taxonomic tree in figure C-1. The panel first considered environmental change in the workplace and later considered transportation facility adaptation to accommodate disabled persons. A third program thrust--transportation of work-related goods and services--was considered by the project team and is described at the end of the environmental-change section (see also volume II Program Paper Number 8).

ENVIRONMENTAL CHANGE IN THE WORKPLACE

Target Population:

°The wheelchair-bound (and ambulatory) disabled.

Strategies:

°Exterior modifications may be made, including changes in:
(1) approaches to the worksite and
(2) entrance and exits.

°Interior modifications may be made, including:
(1) areas associated with preparatory activities,
(2) specific work areas and
(3) amenity areas.

°Modifications of facilities and services for disabled workers may be accomplished through the following schemes:
(1) integration,
(2) semi-integration and
(3) separation.

°The focus on interior modifications emphasizing integration of facilities.

Assumptions and Axioms:

°All types of workplaces are considered.

°The work environments require modification to accommodate the target population.

°Workplace redesign is preferable to matching of jobs to an individual's disability.

°Current technology is adequate to accomplish workplace design or redesign.

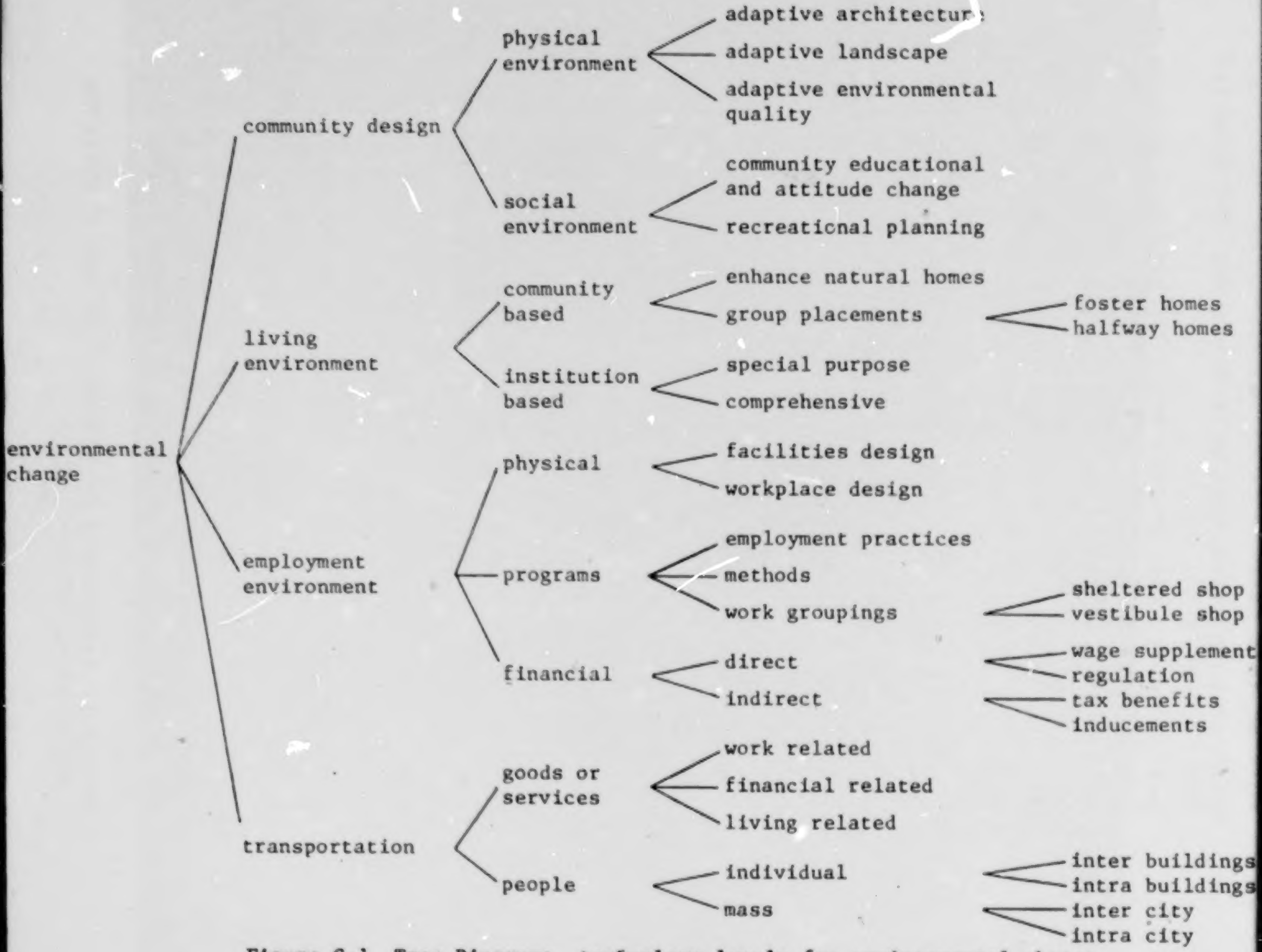

environmental change
community design
physical environment
adaptive architecture
adaptive landscape
adaptive environmental quality
social environment
community educational and attitude change
recreational planning
living environment
community based
enhance natural homes
group placements
foster homes
halfway homes
institution based
special purpose
comprehensive
employment environment
physical
facilities design
workplace design
programs
employment practices
methods
work groupings
sheltered shop
vestibule shop
financial
direct
wage supplement
regulation
indirect
tax benefits
inducements
transportation
goods or services
work related
financial related
living related
people
individual
inter buildings
intra buildings
mass
inter city
intra city

Figure C-1 **Tree Diagram: technology levels for environmental change**

°Workplace redesign requires architects and engineers working as a team.

°Efficient and effective work areas for the disabled can be developed.

°Better design can benefit both disabled and nondisabled workers.

Objective:

°Design or redesign of workplaces which can accommodate both the disabled and nondisabled workers with even-handed consideration for both safety and comfort.

Implementation Requirements:

°Money.

°Manpower (architects and engineers).

°Materials.

°Definitions of space-utilization.

°Specialized equipment.

°Inputs from disabled themselves.

°Efficient management system.

°Governmental "matching funds."

°Federally funded pilot projects.

Affected Individuals, Groups, and Organizations:

°Technological community.

°Engineers (Moderate increase in demand).

°Coworkers and unions (Possible negative attitudes aroused in).

°Management of business and corporate structure.

Group-Discussion Consequences:

°Increased productivity among both disabled and nondisabled.

°Decreased need for supplemental income support.

°Increased status and self-image of disabled.

°Increased political lobbying power.

°Offsetting changes in attitude of nondisabled toward disabled.

°Possible reluctance by disabled to use cumbersome compensating devices.

Hierarchical and Interrelationship Analysis: (See figure C-2.)

Benefits:

- °An increase in the number of disabled employed will increase productivity, proxemics, and visibility.
- °Enhanced access to and compatibility with job environment will increase demand for education, skills, jobs.

Drawbacks:

- °Additional consideration must be given to safety.
- °Additional costs to industry are predicted.
- °Increases in stigmatization of disabled are possible.

Computer-Generated Consequences:

- °Moderate increases in disabled employment result from this program thrust.
- °Safety declines at first but regains previously established levels.
- °Demand for accessible transportation increases considerably.
- °Self-image, proxemics, mobility in the workplace, political power of disabled persons increase proportionately.
- °Productivity increases slightly, while needed supplemental income declines.
- °The status of the disabled family increases along with visibility and public empathy.

Implications for Programs:

- °Care and caution must be exercised to assure that this program thrust is undertaken parallel with adjunct programs to provide training, jobs, and transportation.
- °Rehabilitation therapists, counselors, and educators at the worksite are needed.
- °Less physical intervention technology is needed if workplaces are designed to accommodate the present impairments of disabled persons.

ENVIRONMENTAL CHANGE OF THE TRANSPORTATION SYSTEM

Target Population:

- °The ambulatory disabled (15.7 million persons).

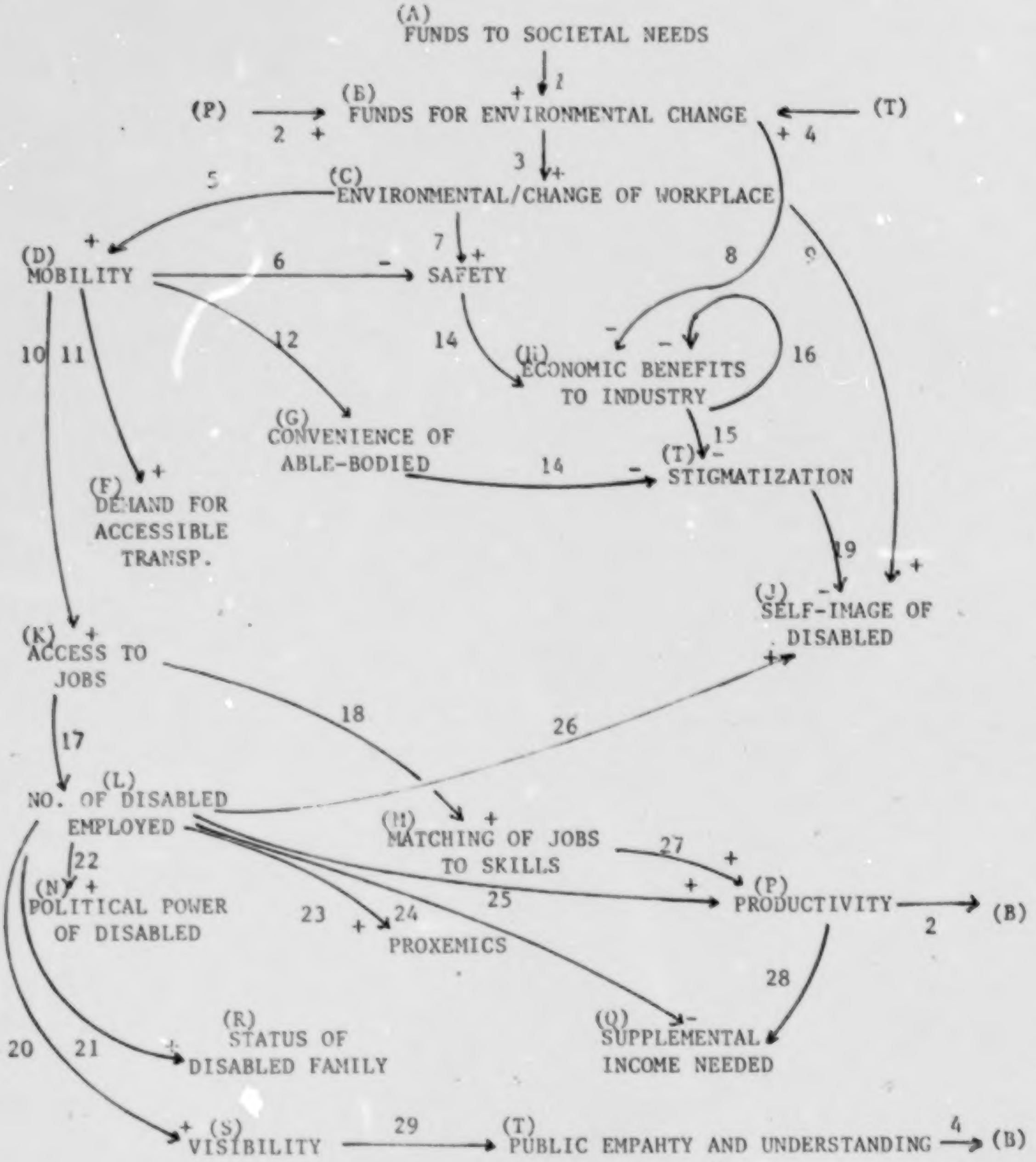

(A) FUNDS TO SOCIETAL NEEDS
1 +
(P) 2 +
(B) FUNDS FOR ENVIRONMENTAL CHANGE
(T) + 4
3 +
5
(C) ENVIRONMENTAL/CHANGE OF WORKPLACE
+
(D) MOBILITY
6 -
7 +
SAFETY
8
9
10
11
12
14
(H) ECONOMIC BENEFITS TO INDUSTRY
-
-
16
(G) CONVENIENCE OF ABLE-BODIED
15
14 -
(T) - STIGMATIZATION
+
(F) DEMAND FOR ACCESSIBLE TRANSP.
19
-
+
(J) SELF-IMAGE OF DISABLED
(K) + ACCESS TO JOBS
+
18
26
17
(L) NO. OF DISABLED EMPLOYED
(M) + MATCHING OF JOBS TO SKILLS
27 +
22
(N) + POLITICAL POWER OF DISABLED
+
(P) PRODUCTIVITY
2 (B)
23 + 24
PROXEMICS
25
28
(R) STATUS OF DISABLED FAMILY
+
(Q) - SUPPLEMENTAL INCOME NEEDED
20
21
+ (S) VISIBILITY
29
(T) PUBLIC EMPAHTY AND UNDERSTANDING
4 (B)

Figure C-2. Hierarchical and interrelationship analysis of environmental change in the workplace program thrust

Strategies:

- °Must incorporate provisions for the following needs:
  - °Mobility sufficient for survival (employment) activities.
  - °Mobility sufficient for betterment (educational) activities.
  - °Mobility sufficient for fulfillment (recreational) activities.
  - °Mobility sufficient for maintenance (economic) activities.

Axioms and Assumptions:

- °Environments in which individuals move include the microenvironment, the mesoenvironments, and the macroenvironment. This program thrust is addressed to the mescoenvironment--the neighborhood, district, and city.
- °Anyone may at any moment become disabled and therefore require adapted transportation.
- °Disabled persons have the same rights as nondisabled persons.
- °Rights of interest groups vary in direct proportion to the political power they wield.
- °Current technologies are adequate for implementation.
- °Accessibility of the environment to the disabled can be increased through changes in existing transportation systems.

Objectives and Performance Requirements:

- °To increase the range of mobility choices for meeting living, economic, employment, educational, and recreational needs among disabled persons.
- °To increase the opportunities for interaction with society at large.

Implementation Requirements:

- °Manpower.
- °Additional facilities.
- °Decentralized management system.
- °Funding for the following:

- °Costs associated with implementation and maintenance.
- °Costs associated with design and creation.
- °Costs associated with enforcement.
- °Design to ensure safety in transit for all passengers.

Life Function Analysis:

- °Increased mobility.
- °Second-order salutory affects upon health, cognitive-intellectual functioning, communication.
- °Vacillations in social-attitudinal functioning.

Affected Individuals, Groups, and Organizations:

- °Neighbors (mixed reaction).
- °Other users of mass transportation.
- °Taxpayers (somewhat negative reaction).
- °Transportation Industry (positive effect).
- °Organizations which currently provide the bulk of transportation services to disabled.
- °Family members (disabled will be less dependent upon them for transportation needs).
- °Minority Groups (Increased disabled visibility would lessen noticeability of minority groups).

Group-Discussion Consequences:

- °Increased mobility will create among the disabled feelings of independence, self-reliance, and self-determination.
- °Increased mobility will increase societal interaction.
- °Increased proxemics will result in a restructuring of the "mental maps" of the disabled population and possible restructuring of "physical maps" as well.
- °Increased mobility will produce attendant increases in visibility, interaction, and integration.
- °Polarization between disabled and nondisabled or empathic acceptance are equally possible.
- °Attendant increases in disabled productivity and standards of living result in a higher GNP.
- °Political lobbying power by disabled interest groups increases.

Hierarchical and Interrelationship Analysis: (See figure C-3.)

- °Funds applied to the adaptation of transportation increase mobility.
- °Increased mobility produces increases in the following:
    - °Accessibility of jobs
    - °Visibility
    - °Proxemics
    - °Community integration
    - °Other environmental changes
- °Increased mobility produces decreases in the following:
    - °The number of disabled employed
    - °Facilities for able-bodied
- °Increased access to jobs would increase the total labor force and productivity slightly.
- °Increased visibility is expected to adversely affect public reaction slightly.

Computer-Generated Consequences:

- °The most directly affected life function is mobility.
- °The incremental gain in mobility due to this program thrust is moderate but not substantial
- °Visibility increases considerably.
- °When programs for the disabled outstrip societal capability to provide jobs, there is an increase in unemployment.
- °Productivity increases, while unemployment decreases somewhat.
- °Under the reduced-growth scenario, this program causes a substantial increase in unemployment.
- °Public reaction is somewhat negative, especially in the reduced-growth scenario.
- °There must be coordination and harmony in the administration of programs.
    - °Little is gained when the disabled are incorporated into the labor force by rehabilitation programs if there are no jobs available.

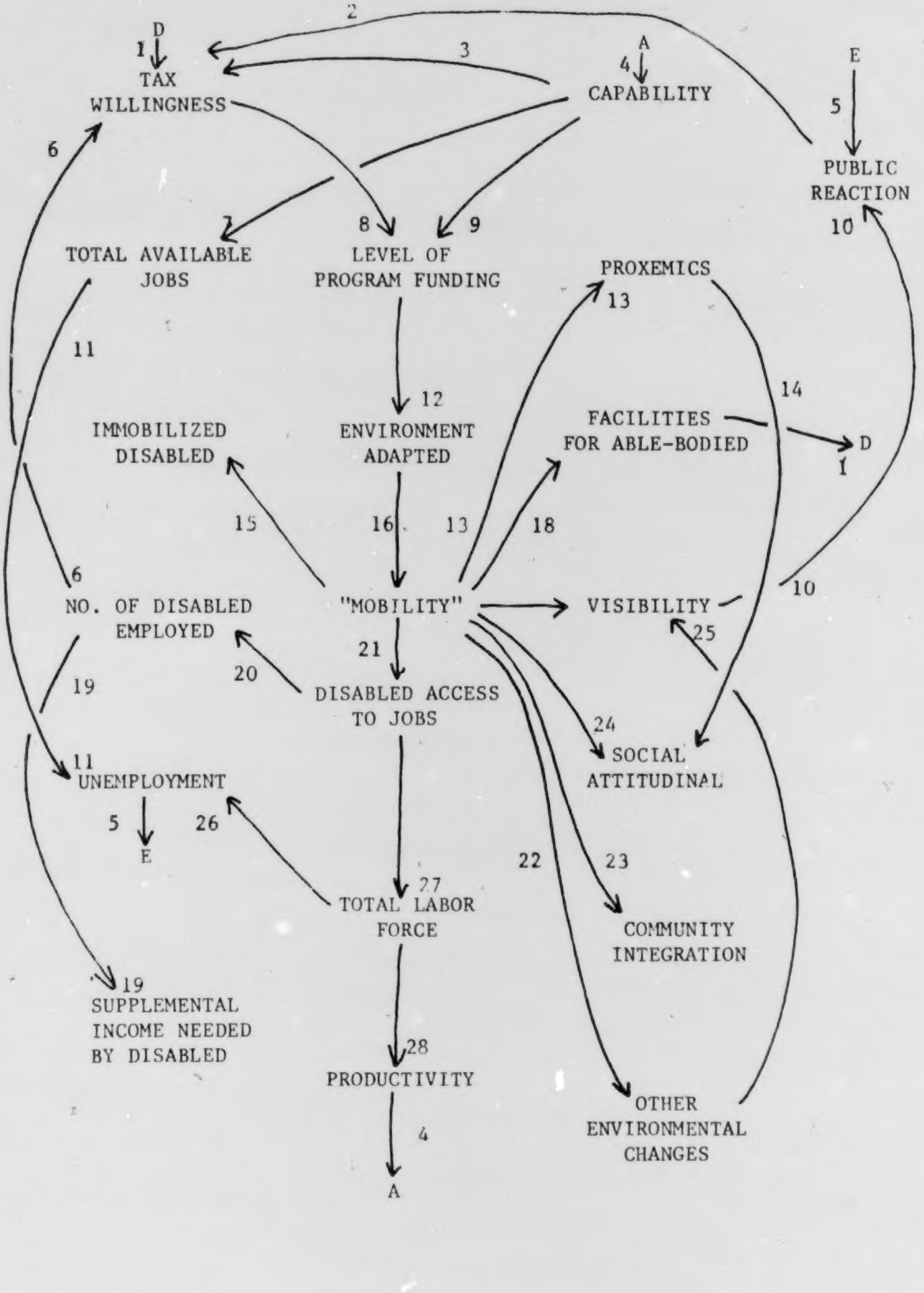

D
1
TAX WILLINGNESS
2
3
A
4
CAPABILITY
E
5
PUBLIC REACTION
10
6
7
TOTAL AVAILABLE JOBS
8
9
LEVEL OF PROGRAM FUNDING
PROXEMICS
13
11
12
14
IMMOBILIZED DISABLED
ENVIRONMENT ADAPTED
FACILITIES FOR ABLE-BODIED
D
1
15
16
13
18
6
NO. OF DISABLED EMPLOYED
"MOBILITY"
VISIBILITY
10
25
21
19
20
DISABLED ACCESS TO JOBS
24
11
UNEMPLOYMENT
SOCIAL ATTITUDINAL
5
26
E
22
23
27
TOTAL LABOR FORCE
COMMUNITY INTEGRATION
19
SUPPLEMENTAL INCOME NEEDED BY DISABLED
28
PRODUCTIVITY
OTHER ENVIRONMENTAL CHANGES
4
A

Figure C-3. Hierarchical and interrelationship analysis of environmental change in mobility

- °Little benefit is derived from giving the disabled access to jobs if they are not also trained to assume the positions of employment that are available in society.
- °Little benefit is derived from adapting transportation facilities if places of employment and public buildings are not also appropriately modified to enable access by the disabled.

Implications for Programs:

- °Policy considerations relate to manpower requirements, technological and physical design, guidelines and standards, and socio-political behavior.
- °A data base, containing information about disabilities and environmental change must be expanded.
- °Although the technology for implementing this program thrust is available, economic and monetary incentives are severely lacking.
- °Careful consideration must be given to the establishment and enforcement of guidelines and standards.
- °Compliance incentives can be increased through either stronger negative or stronger positive reinforcement.
- °Policymakers and the general public need to become better informed about the social and political behavior patterns of the disabled.
- °The disabled must become more politically astute.
- °The tradeoff in terms of cost versus benefit for this program thrust must be compared with other alternatives.

ENVIRONMENTAL CHANGE IN TRANSPORTATION OF WORK-RELATED GOODS AND SERVICES

Target Population:

- °The immobilized or nonambulatory disabled.

Strategies:

- °The severely disabled can be moved to workplaces so they can be productive.
- °The work-related goods and services can be transported to the homes and institutions of the nonambulatory disabled.

Axioms and Assumptions:

- °This program thrust is intended to overcome a problem of remoteness experienced by disabled persons in relation to employment.
- °Technologies are available or could be developed to sustain this program thrust.
- °Only delivery of work-related goods and services to the home or living environment is considered.
- °The required resources can be made available in the home.
- °Procedures of matching the resources in the home and the skills of the disabled to the jobs available must be applied.
- °There are approximately 2 million immobilized or nonambulatory disabled not in the workforce who could be.

Objectives and Performance Requirements:

- °To provide the immobilized disabled access to jobs and to assimilate them into the workforce.
- °To make the disabled more productive members in society.
- °To require the disabled worker to meet certain performance standards.
- °To provide access to jobs to 90 percent of the immobilized disabled by 1985.

Implementation Requirements:

- °Start-up costs or implementation incentives could be provided by government.
- °If this program thrust could evolve from a profit-generating program within private enterprise, then the necessary financing would come from the private sector.
- °Organizational tasks would have to be decentralized by area.
- °Procedures for matching each disabled individual to a job could be performed by local organizations.
- °Eligibility requirements will be a difficult issue to resolve.
- °Resources required are manpower, materials, and money as follows:

- °Manpower--counselors, trainers, delivery and pick-up personnel, and supervisors.
- °Materials--work area in the home, tools, delivery equipment, tests to facilitate matching.
- °Money--start-up, salaries, matching, equipment, materials, and incentives.

°This program thrust could be self-supporting under scenarios I and II because of expansion in the job market. Under scenario III this program thrust might require considerable public financing.

Life-Function Analysis:

- °Health appears to be unaffected.
- °Specific mobility problems will not be ameliorated but substitution will be made for them.
- °Communication functioning will be improved through possible use of telecommunication devices.
- °Cognitive-intellectual and social-attitudinal functioning will be improved.

Affected Individuals, Groups, and Organizations:

- °Neighbors may get disgruntled by appearance of delivery trucks in neighborhood.
- °Ambulatory disabled and nondisabled may feel slighted.
- °The transportation industry as well as the rehabilitation community would be affected in diverse ways.
- °The Labor Department would have to set forth rules governing employee-employer relations for home-based employment.
- °The unions may react adversely in periods of high unemployment.
- °Zoning regulations may have to change to allow delivery trucks in the neighborbood.
- °Employment practices and employers would be affected.
- °Other family members will be affected by disabled person's being home all of the time and by his need for a workplace.

Group-Discussion Consequences:

- Mobility problems of disabled are alleviated insofar as such problems affect their access to jobs.
- There is an increase in productivity and a diminished need for supplemental income.
- There is a diminished need for total rehabilitation and transfer funds.
- There may be an increase in union activism.

Hierarchical and Interrelationship Analysis: (See figure C-4.)

- Figure C-4 depicts the causal diagram developed for this program thrust based on group-discussion consequence statements (Corresponding links in the causal diagram are indicated).

Implications for Programs:

- This program thrust should be considered as substitutionary in the sense that it compensates for the inadequacy of technologies to ameliorate mobility problems among certain cases of the nonambulatory disabled.

RESULTS FROM THE PHYSICAL INTERVENTION WORK SESSION

The physical intervention work session considered two program thrusts--physical therapeutic agents (PTA) and rehabilitation devices (RD). The results of the consideration of these two program thrusts are briefly summarized below.

Physical Therapeutic Agents

The physical intervention panel first assessed the consequences associated with the introduction of all types of physical therapeutic agents (PTA), as depicted on the taxonomic tree in figure C-5.

Target Population:

- Persons whose disabilities have resulted from the following causes:
  - Arthritis
  - Cerebral palsy
  - Spinal cord injury
  - Epilepsy
  - Coronary heart disease
  - Hearing impairments
  - Diabetes
  - Kidney disease
  - Cancer
  - Stroke
  - Emphysema
  - Accidents and others

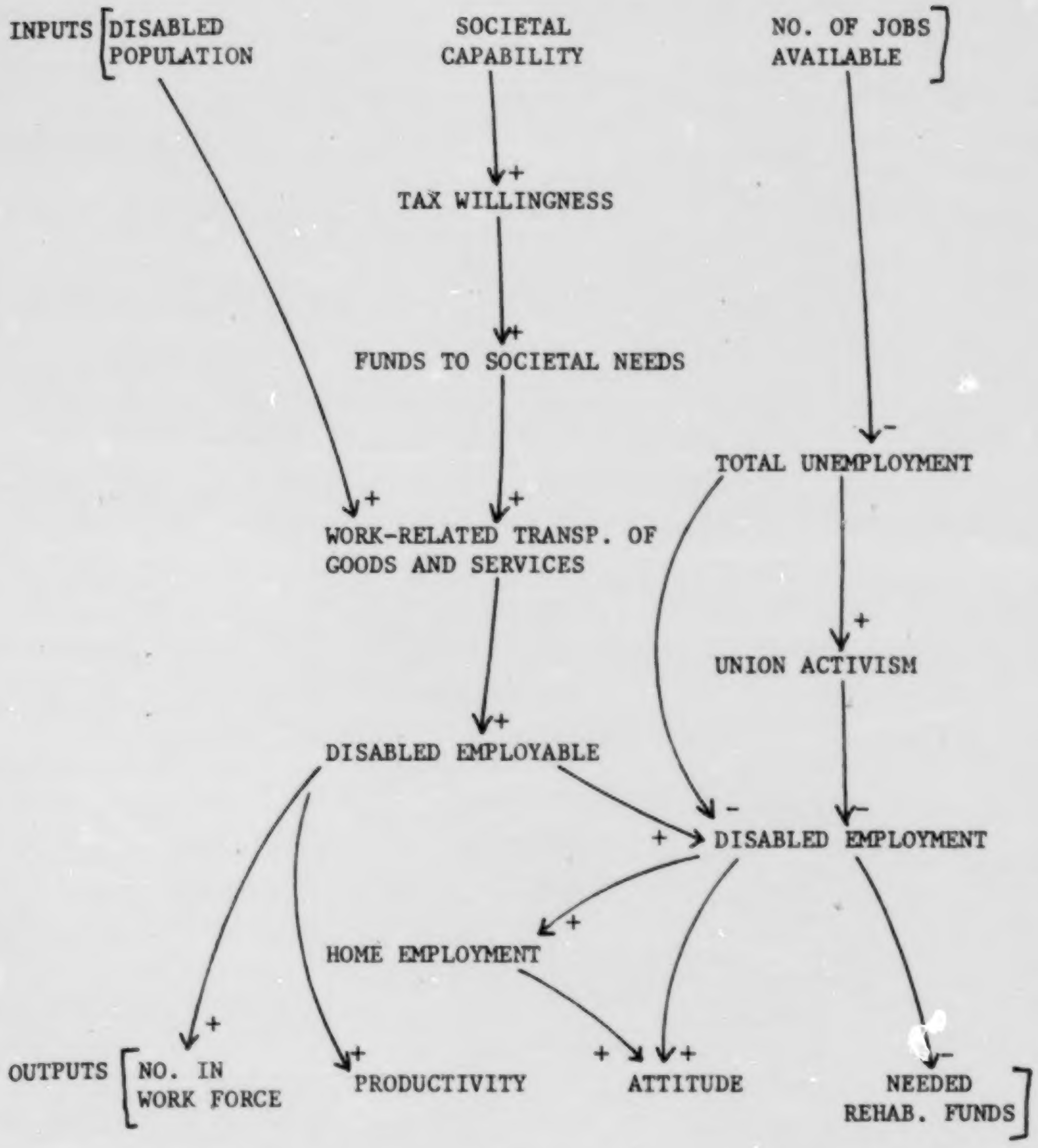

INPUTS
DISABLED POPULATION
SOCIETAL CAPABILITY
NO. OF JOBS AVAILABLE
+
TAX WILLINGNESS
+
FUNDS TO SOCIETAL NEEDS
-
TOTAL UNEMPLOYMENT
+
+
WORK-RELATED TRANSP. OF GOODS AND SERVICES
+
UNION ACTIVISM
+
DISABLED EMPLOYABLE
-
-
+
DISABLED EMPLOYMENT
+
HOME EMPLOYMENT
+
+
+
+
-
OUTPUTS
NO. IN WORK FORCE
PRODUCTIVITY
ATTITUDE
NEEDED REHAB. FUNDS

Figure C-4. Causal diagram for the program thrust transportation of work-related goods and services.

- °However, many other disability groups can benefit from PTA.

Strategies:

Strategies were chosen in accordance with one or both of the following criteria:

- °The strategy must include biological change.
- °The strategy must be either therapeutic or diagnostic.

Strategies include the following.

- °Methods to inhibit disabling factors.
- °Methods to eradicate disabling factors.

Axioms and Assumptions:

- °Adequate technologies are already available.
- °PTA do have salutary effects upon the disabled and are not products of quackery.
- °Acceptance of various PTA is not uniform.
- °More critical evaluation of PTA is needed.
- °Market for some PTA is small.
- °Many PTA are very expensive.

Objectives and Performance Requirements:

- °The program thrust must minimize the debilitating biological effects of disability.
- °The program thrust should increase the supply of PTA through increased funding and through reduction of cost from technological breakthrough.
- °The program thrust should lessen dependence of disabled persons upon other types of treatment (i.e., drugs).

Implementation Requirements:

- °Manpower, materials, technological development, financial capability, organizational techniques, and provision for maintenance.
- °Manpower:
    - °Professionals to develop and use PTA.
    - °Subprofessionals to design, produce, implement, and maintain PTA.
    - °Paraprofessionals to assist professionals and to train and instruct users of the devices.

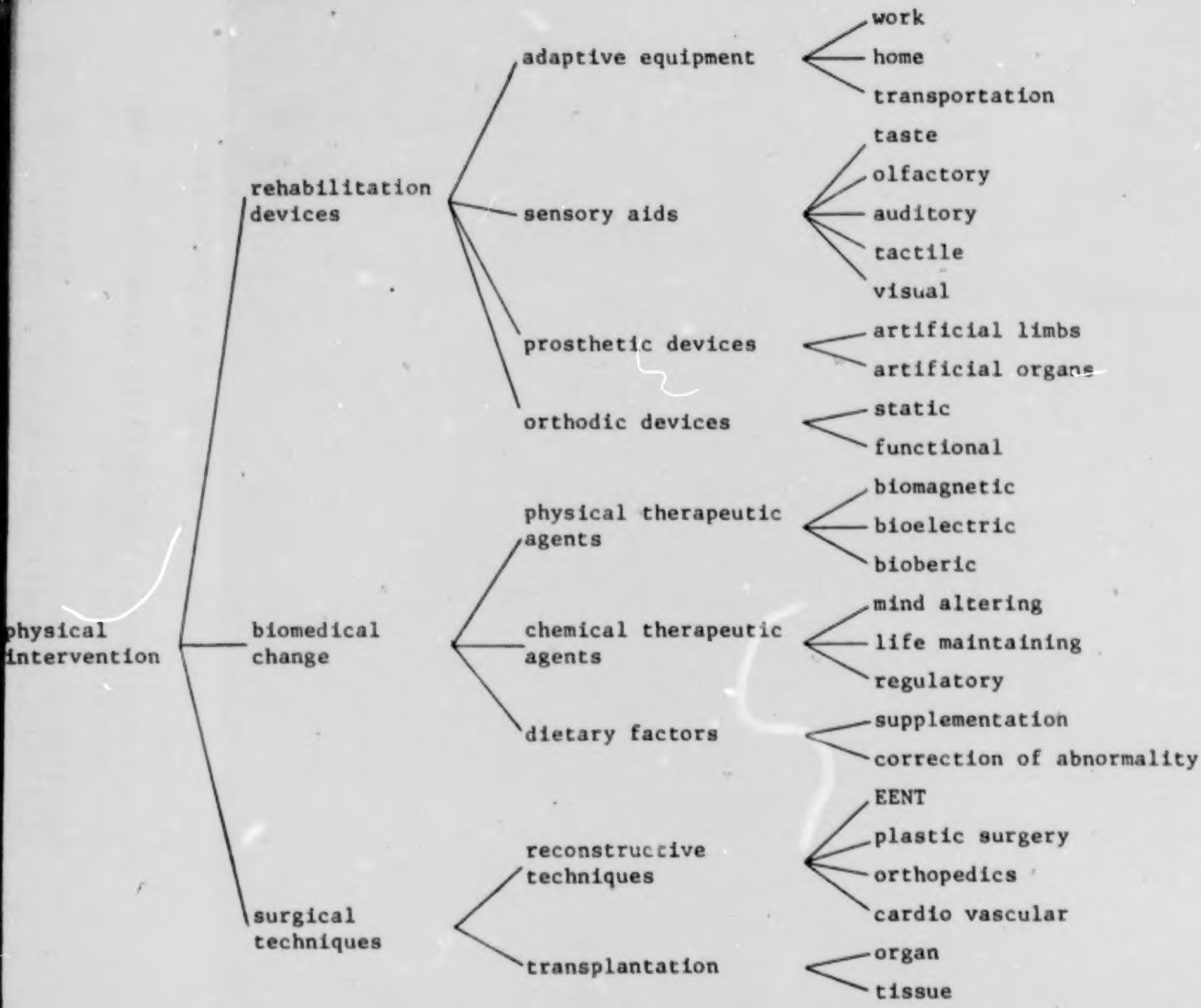

physical intervention
rehabilitation devices
adaptive equipment
work
home
transportation
sensory aids
taste
olfactory
auditory
tactile
visual
prosthetic devices
artificial limbs
artificial organs
orthodic devices
static
functional
biomedical change
physical therapeutic agents
biomagnetic
bioelectric
bioberic
chemical therapeutic agents
mind altering
life maintaining
regulatory
dietary factors
supplementation
correction of abnormality
surgical techniques
reconstructive techniques
EENT
plastic surgery
orthopedics
cardio vascular
transplantation
organ
tissue

Figure C-5. Tree Diagram: technology levels for physical intervention

- °Materials:
  - °Rare materials and unusual space-utilization requirements.
- °Technology:
  - °More applications of technology to rehabilitation.
  - °Basic research directed toward the development of new technology.
  - °Education to provide for training and utilization of new PTA.
- °Financial Resources:
  - °Funding is needed for development, implementation, and maintenance because of manpower and material requirements.
  - °The federal government must provide for research and development.
  - °Business and industry should become viable financial channels once development is underway.
  - °Costs of utilization and maintenance is highly variable and therefore unpredictable.
  - °Private enterprise may assume responsibility.
- °Administration and Management:
  - °Administration and management would grow out of traditional agencies, such as the Federal Food and Drug Administration.
  - °Although centralized management may not be required, programs (provided by traditional agencies) to support PTA are required.
  - °Management will ultimately be constrained by laws, and the most probable form of management is decentralized regional with local control.

Life-Function Analysis:

- °All life functions are perceived as positively affected.
- °Social-attitudinal and mobility appear to be the most beneficially affected.
- °Mobility will substantially improve for persons with motor disorders and chronic diseases.
- °Communication will improve for the behaviorally impaired as well as for those with motor or sensory impairment.

- °Cognitive-intellectual life functions improve for persons with behavioral impairments.
- °Health improves markedly for persons with chronic diseases, but little for others.
- °A negative effect upon social-attitudinal functioning is possible through increased exposure to the nondisabled resulting from improvements in the health and mobility life functions.

Affected Individuals, Groups, and Organizations:

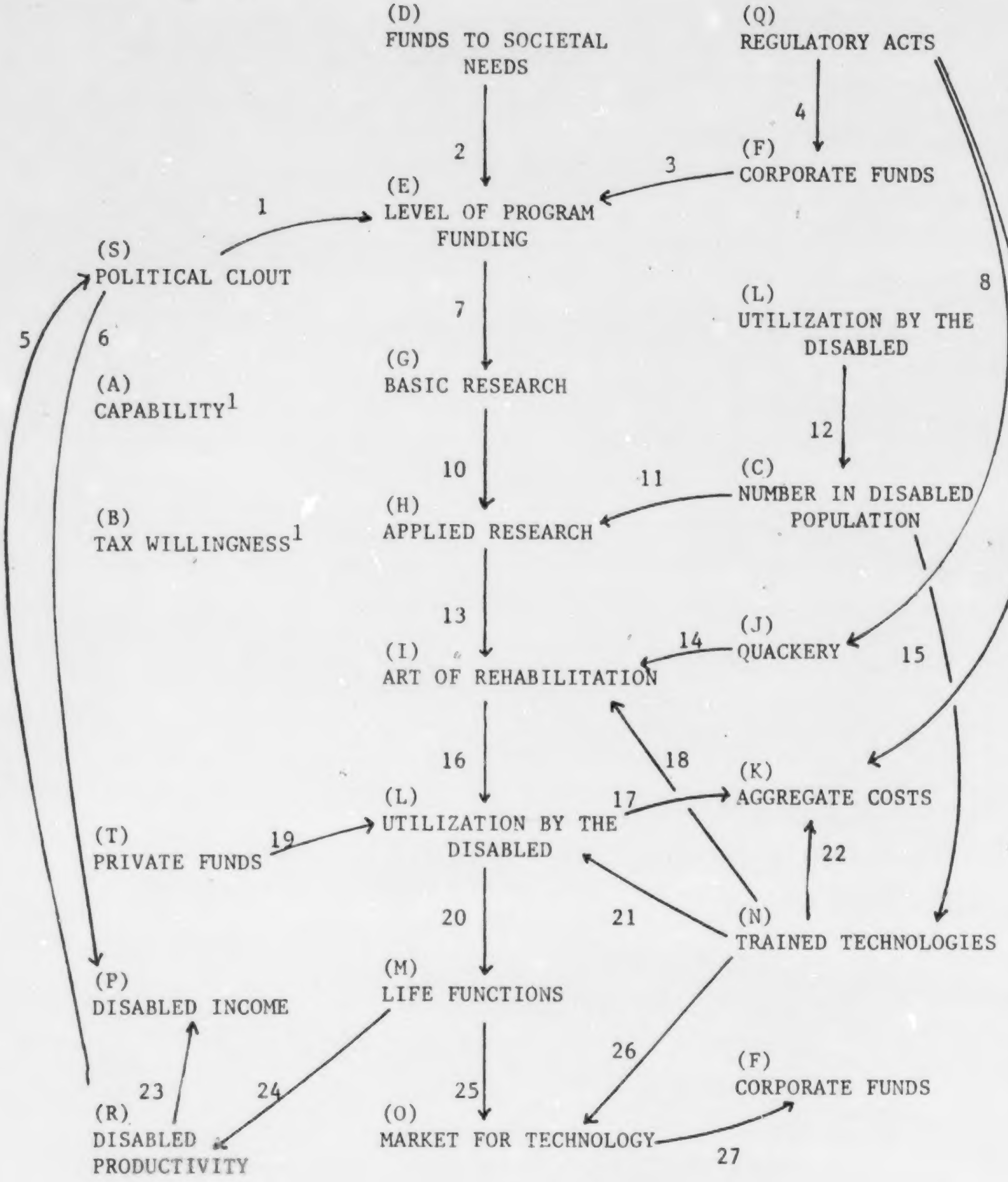
- °The effects of PTA programs would be broadly felt throughout the general population, the technological community, numerous organizations, the family, and other groups.
- °General population:
  - °Neighbors, peers, taxpayers, nondisabled employed will be affected by the improved conditions of the disabled.
- °Technology community:
  - °Within the technological community there is a need for more application personnel (such as physical therapists) and for basic rehabilitation research.
  - °Environmental change technologies must adapt to the enhanced mobility and health produced by PTA. In particular, transportation adaptation and architectural adaptation technologies must develop revised or new transportation systems and buildings to accommodate the changing needs of the disabled.
- °Organizations:
  - °Medical, educational, legal, health-care, and governmental organizations must be prepared for the consequences of extensive programs utilizing PTA.
- °Families:
  - °Families must prepare for the increased options available to the disabled through increased options available to the disabled through increased mobility and income.
  - °Better health and mobility lead to increased income which can be used to offset expenditures for therapy.

Group-Discussion Consequences

- °Expectations of disabled persons for an improved quality of life increase (link 21, figure C-6).
- °Consequently the disabled increase their demands for services, and benefits (link 17, figure C-6).
- °Government must revise spending plans for social needs to accommodate demands of disabled persons (link 2, figure C-6).
- °A growing service delivery system supporting PTA will result in greater employment, but a corresponding growth in quackery can be expected.
- °There may be a lessened requirement for institutions that care for "unrehabilitateable" disabled.
- °Increased demands are placed upon the engineering, medical, and educational professions for support of programs involving PTA (link 15, figure C-6).
- °There is an increased need for services and benefits heretofore accessible only to the nondisabled (link 5, figure C-6).
- °The disabled become a much more visible minority (link 1, figure C-6).
- °The disabled benefit society through greater productivity during working years (link 24, figure C-6).
- °There may be a possible increase in hereditary disorders brought about by increased marriage and family activity of disabled persons.

Heirarchical and Interrelationship Analysis: (See figure C-6.)

- °Funds applied to programs in PTA increase basic research and applied research (links 7 and 10).
- °As research proceeds, the "art" of rehabilitation improves (link 13).
- °Improvement in rehabilitation research increases utilization by the disabled and improves life functions (links 16 and 20).
- °Increases in life functions increase productivity of disabled persons (link 24), income of disabled persons (link 23), and ultimately results in further increases in life functions (links 20).
- °Regulation diminishes quackery and increases aggregate costs.


(D)
FUNDS TO SOCIETAL NEEDS
(Q)
REGULATORY ACTS
4
2
(F)
CORPORATE FUNDS
3
(E)
LEVEL OF PROGRAM FUNDING
1
(S)
POLITICAL CLOUT
8
9
7
(L)
UTILIZATION BY THE DISABLED
5
6
(A)
CAPABILITY¹
(G)
BASIC RESEARCH
12
10
11
(C)
NUMBER IN DISABLED POPULATION
(B)
TAX WILLINGNESS¹
(H)
APPLIED RESEARCH
13
14
(J)
QUACKERY
15
(I)
ART OF REHABILITATION
16
18
(K)
AGGREGATE COSTS
17
(L)
UTILIZATION BY THE DISABLED
(T)
PRIVATE FUNDS
19
22
20
21
(N)
TRAINED TECHNOLOGIES
(P)
DISABLED INCOME
(M)
LIFE FUNCTIONS
26
(F)
CORPORATE FUNDS
23
24
25
(R)
DISABLED PRODUCTIVITY
(O)
MARKET FOR TECHNOLOGY
27

---

[1] These variables were used for threshold evaluation only

Figure C-6. Hierarchical and interrelationship analysis of physical intervention, physical therapeutic agents

- °Another (see link 7) enhancement cycle is found in program funding to basic research, to applied research, to art of rehabilitation, to utilization by the disabled to life functions, to disabled productivity, to political clout, to level of program funding. (See volume 5--Work Session Reports--for a description of the dynamic implications of enhancement cycles and diminution cycles.)

Computer-Generated Consequences:

- °The model suggests several possible deleterious effects.
  - °Corporate funds are diminished by regulatory acts.
  - °Rehabilitation is diminished by the influence of quackery, augmented by increased research.
- °The model also suggest several salutory consequences.
  - °Disabled productivity increases somewhat.
  - °Life functions improve slowly.
- °For the variable interactions identified and the strengths of the couplings used, the possible dynamics for this program thrust are somewhat pessimistic.

Implications for Programs:

- °Five major areas of policymaking are crucial to development of the program thrust involving PTA.
  - °Economic disincentives for developing, implementing, and maintaining PTA must be eliminated.
  - °Regulatory agencies must take a positive approach to stimulate growth in the development of PTA.
  - °Government must bear the responsibility of "seeding" to stimulate growth of programs in PTA.
  - °Centralized governmental monitoring must be provided within federal agencies to coordinate development, implementation, and maintenance of PTA among decentralized service-delivery agencies.
  - °Government must establish an advocacy provider-consumer structure to ensure controlled and fair growth and to monitor PTA programs.

Rehabilitation Devices

The physical-intervention panel also assessed the consequences associated with the introduction of all types of rehabilitation devices (RD), as depicted on the taxonomic tree in figure C-5.

Target Population:

- °Disability groups for whom strategies of RD program thrusts are beneficial.

Strategies:

- °The types of RD could be thought of as strategies for RD physical intervention and include adaptive equipment, sensory aids, prosthetic devices, and orthodic devices.

Axioms and Assumptions:

- °RD technology can be improved and ranges from prototype devices to highly marketable devices.
- °Many RD are simple.
- °RD technology advances require sophisticated engineering.
- °Electronics is the most promising area for RD development.

Objectives and Performance Requirements:

- °To permit normal life functions among the disabled through immediate enhancement and without the life-function disabling paradox inherent in long-term rehabilitation techniques.

Implementation Requirements:

- °Required resources include manpower, research, and management.
- °Manpower:
  - °Educational and technical personnel are needed in large numbers because the required ratio of professionals to patients is very high.
  - °Professionals must create new roles to fulfill anticipated needs and educate other professionals for these roles.
- °Research:
  - °The difference between basic and applied research in RD is more political than substantive.

°Management:

°Management must come from both public and private (advocacy) sectors of society.

°The management scheme must provide for optimum dissemination and utilization of new technological developments taking place in both the public and private sectors.

Life-Function Analysis:

°All life functions are, in general, positively impacted.

°Greatest effects are in the mobility and social-attitudinal life functions.

°Persons with motor disorders receive the greatest improvement in the mobility and social-attitudinal life functions followed by persons with sensory disabilities.

°Mobility and social-attitudinal functioning of the chronic diseased are moderately improved.

°Mobility and social-attitudinal functioning of persons with behavioral disorders are slightly improved.

°Health is improved significantly for persons with chronic diseases, moderately for persons with motor disabilities, and very slightly for persons with behavioral disorders.

°Cognitive-intellectual capacities are most improved in persons with sensory disorders, slightly improved in persons with behavioral disabilities.

°Communication is most improved for persons with sensory disorders, and slightly improved for persons with motor disabilities.

°Unaffected life-functions include the following:

°The health of persons with sensory disorders.

°The cognitive-intellectual capacities of persons with chronic diseases.

°The communication capacities of persons with behavioral disorders.

°Mobility and social-attitudinal functioning of approximately 4 million disabled persons are improved.

°Health is improved in approximately 2 million persons, while communication and cognitive-intellectual functioning are improved in approximately 1 million.

Affected Individuals, Groups, and Organizations:

- °The general public will feel additional tax burdens.
- °The medical profession is less significantly affected by RD than by PTA.
- °The technological community must guard against possible research duplication, but will prosper from the increased opportunity to design new devices.
- °Health-care organizations must alert professionals to new devices before the devices are placed into service.
- °The insurance industry may be affected by increased demand for RD.
- °State governments are only a part of the service-delivery system which may be affected.
- °Families require less funding and resource allocation for health care and may consequently use finances to place additional demands for goods and services.

Group-Discussion Consequences:

- °Many of the consequences for RD programs are similar to those for PTA programs.
- °There would be a change in the population of institutions and an increase in the demand for providers of new types of services.
- °The increase in public-financed health-care cost may be offset by a decrease in welfare costs made possible by greater productivity.
- °Visibility of the disabled increases.
- °Deciding who shall use rehabilitation devices and how the devices are provided can be a significant problem in equity.
- °Economic and sociopolitical problems with rehabilitation devices may be lessened for the general public and policymaker by the prospect of use of the devices by the general public as well as by the disabled.
- °RD technological developments present a possibility for increases in quackery and economic exploitation.
- °Expansion of RD programs will ultimately initiate changes in governmental policies and in medical and engineering support professions.

°Government spending in areas relating to the disabled would have to be reordered.

°Ultimately there would be a lessened distinction between disabled and nondisabled persons.

Hierarchical and Interrelationship Analysis: (See figure C-6.)

°Work session participants re-examined the hierarchical and interrelationship analysis graph for PTA and concluded it was applicable throughout the program thrust tree. Therefore the causal diagram of figure C-6 and the associated computer generated consequences may be viewed as general for the physical intervention technology group.

Implications for Programs:

°There are four major areas of policymaking that are crucial to development of the program thrust.

°Policies relating to the elderly are particularly important since this group is such a large percentage of the target population. (The increased independence of elderly persons as a result of RD must be weighed against the societal impact of diversion of funds to an essentially nonproductive segment of the population.)

°The insurance implications of increased participation of the disabled in the workforce must be considered. Legislative support may be required to ensure equitable coverage. Such legislation may require private companies to underwrite the special risks of the disabled employee or mandate federal underwritting of such risks.

°International ramifications of the program thrust implementing RD could alter the following:

°U.S. balance of payments.

°Existing tariff regulations for cost-effective dispersement of the devices

°U.S. regulations and standards for RD.

°Free access to and exchange of information in the development and use of rehabilitation devices must be provided. Better avenues of information exchange between the medical profession which disperses and installs RD and the electronics industry which develops the

RD could be accomplished through licensing of a new type of professional with both medical and engineering backgrounds.

RESULTS FROM THE TRAINING AND COUNSELING WORK SESSION

The training and counseling work session treated two program thrusts preschool academic education (PAE) and vocational education (VE). The main items of interest that were generated by this work session are summarized below.

Preschool Academic Education

Preschool academic education was the first program thrust considered by the training and counseling work session. The relationship of this program thrust to other program thrusts in the training and counseling technology area is depicted by the taxonomic tree in figure C-7.

Target Population:

- °Preschool disabled children, who make up 7 percent (or about 1 million) of all children under 5 years.

Strategies:

- °The early identification of and intervention in any disability is recognized as a significant advantage.

Assumptions and Axioms:

- °Current technologies are inadequate to identify all disability types in preschool-age children.
- °Early intervention (identification, preventive treatment, corrective treatment, and training) is desirable.
- °Some early-intervention technology is available.
- °Public support for this program thrust is likely because it deals with children.
- °The age at which intervention is begun determines the level of improvement eventually realized.
- °Home maintenance of children is generally preferable to institutionalization.
- °Economic and administrative consideration suggest that funds must come from the public sector.

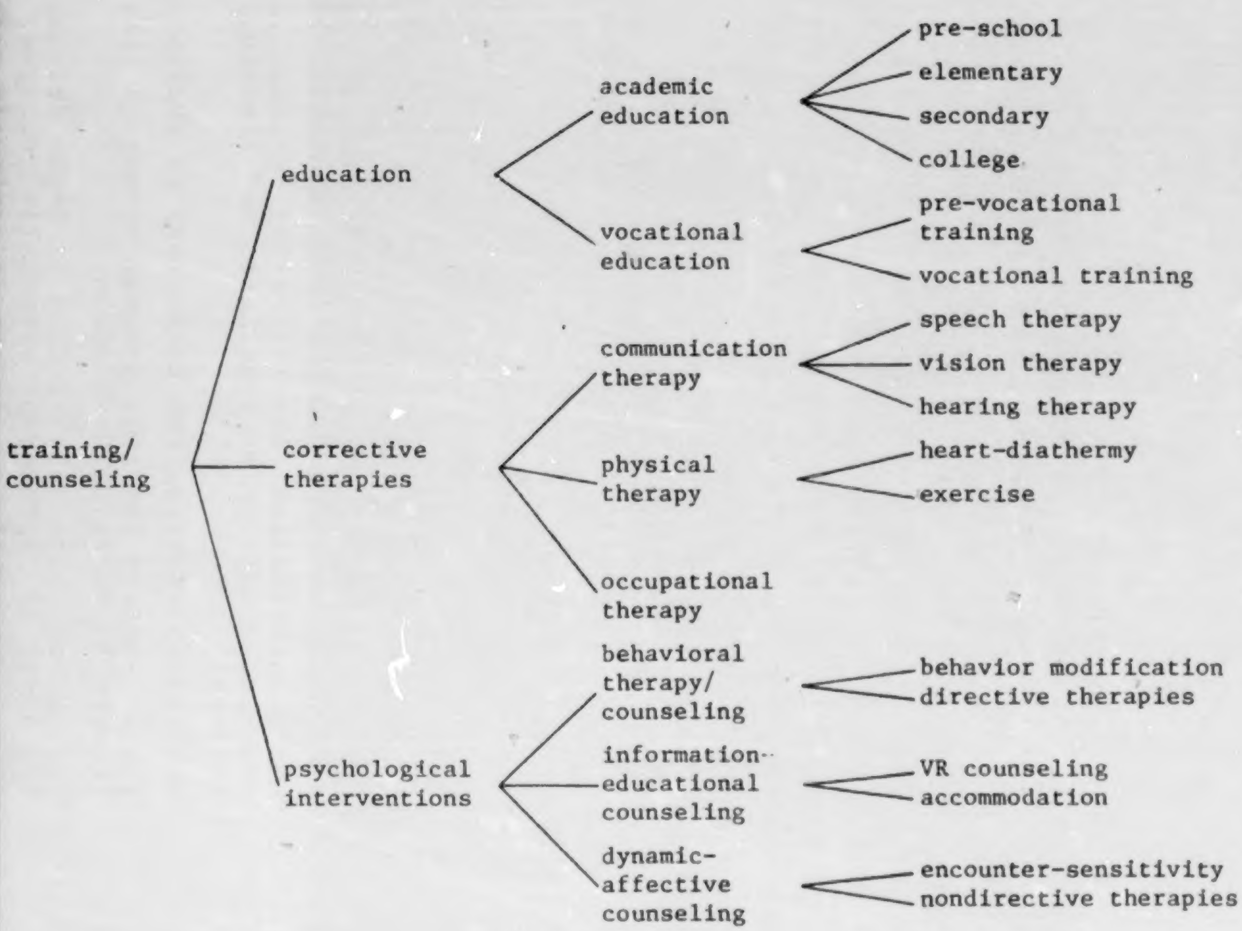

training/ counseling
education
academic education
pre-school
elementary
secondary
college
vocational education
pre-vocational training
vocational training
corrective therapies
communication therapy
speech therapy
vision therapy
hearing therapy
physical therapy
heart-diathermy
exercise
occupational therapy
psychological interventions
behavioral therapy/ counseling
behavior modification
directive therapies
information-educational counseling
VR counseling
accommodation
dynamic-affective counseling
encounter-sensitivity
nondirective therapies

Figure C-7. Tree Diagram: technology levels for training/counseling

- °Whether a program is voluntary or compulsory will be determined by an evaluation of individual vs. societal rights.

Objectives and Performance Requirements:

- °Ideally programs for PAE should be organized around a decentralized system of disability centers scattered around the country.
- °The disability centers would disseminate resources to the private homes of disabled children and would be controlled through a central agency.

Implementation Requirements:

- °Funding must come from government.
- °New technology must be developed.
- °Current technology must be applied.
- °Costs are projected at $1000 per student per year or 1 billion dollars per year for 1 million children.
- °These costs may be offset by future increases in disabled productivity and income.
- °Full implementation of PAE may occur by 1990 at an annual cost of 1 billion dollars.

Life-Function Analysis:

- °All life functions should improve, with greatest improvements occuring in the health and social-attitudinal life functions for both children and their parents.
- °Self-concepts of disabled children would be enhanced.
- °Cognitive-intellectual functioning would improve substantially since the emphasis in PAE is academic education.
    - °Children will benefit from early stimulation of their cognitive responses.
    - °Cognitive-intellectual development among children with sensory impairments could be enhanced.
- °Communication is enhanced for the mentally retarded and the sensory impaired by PAE programs.
- °Some increases in self-mobility and geographic mobility may result.

Affected Individuals, Groups, and Organizations:

- °There may be a lessened requirement for criminal programs, penal institutions, and institutions for the disabled.
- °The size of the disabled population may be decreased.
- °Living and unborn siblings of disabled children may experience some improvement in life functions.
- °Through treatment of hereditary disability early intervention applied to children of the disabled may further reduce the size of future disabled populations.
- °In addition, PAE programs will serve to intensify and increase the success of special education programs (links 11, 12, figure C-8).

Group-Discussion Consequences:

- °Offsetting possible disabled population reductions are increases in the number of detected disabilities.
- °Cost constitutes the largest single negative consequence (links 2, 23, 24, 28, figure C-8).

Hierarchical and Interrelationship Analysis: (See figure C-8 and C-9.)

- °Two causal diagrams of the PAE program thrust were developed and are depicted in figures C-8 and C-9. The first model (figure C-8) emphasizes economics of service delivery, whereas, the second model (figure C-9) focuses upon the logistics of the PAE program thrust.
  - °Both negative and positive major feedback cycles are absent from the diagram shown in figure C-8.
  - °Only one major feedback cycle is observed in figure C-9 and proceeds from "societal attitude and confidence" to "level of program funding."

Computer-Generated Consequences:

- °The GSIM simulation of the causal diagram depicted in figure C-9 indicated that the diagram is unrealistically optimistic about this program thrust.
- °This unwarranted optimism is due to an absense of negative feedback cycles (or even negative interactions) that would balance the strong growth tendencies when all quantities are positively impacted.

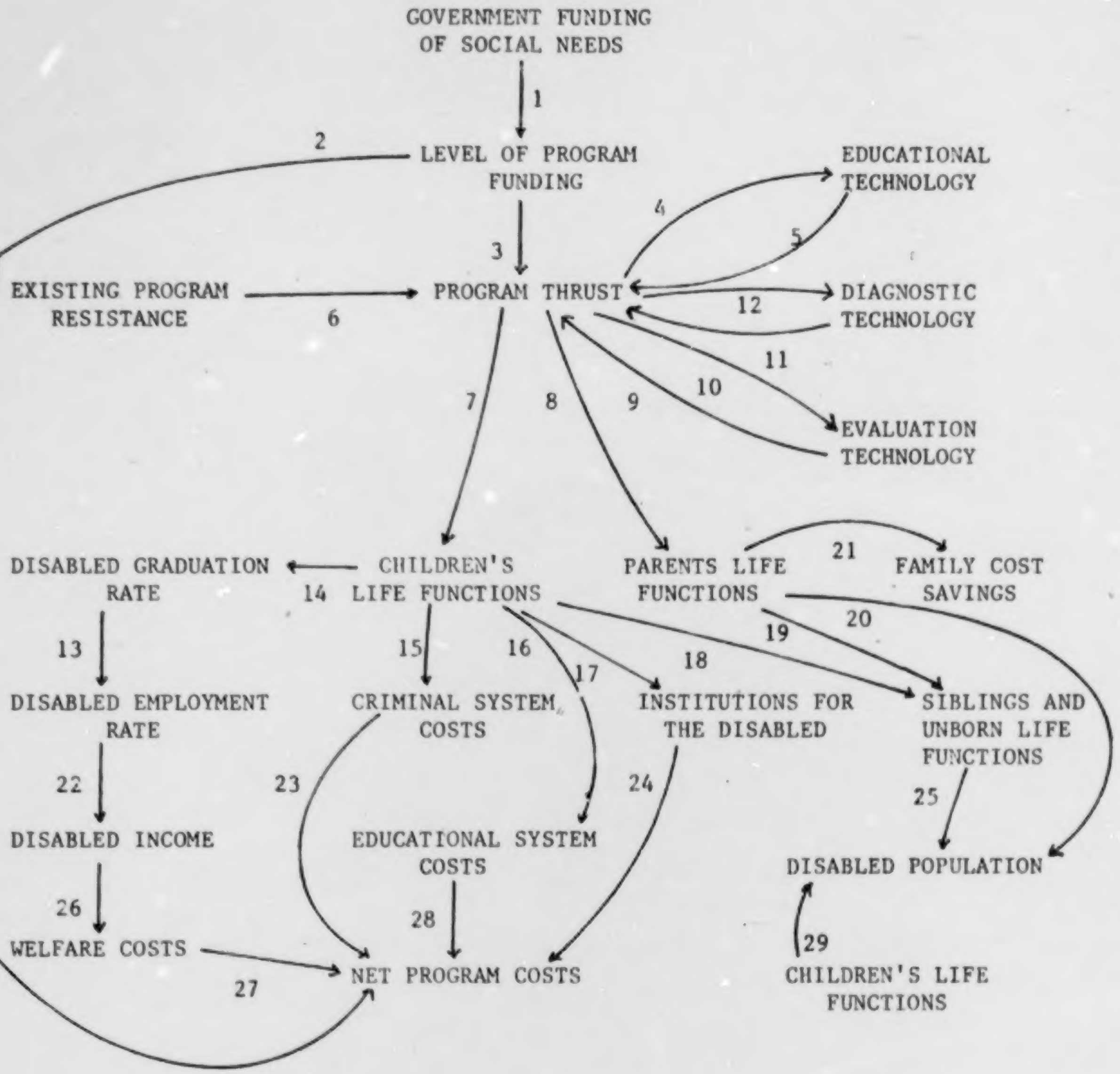

GOVERNMENT FUNDING OF SOCIAL NEEDS
1
2
LEVEL OF PROGRAM FUNDING
EDUCATIONAL TECHNOLOGY
4
5
3
EXISTING PROGRAM RESISTANCE
6
PROGRAM THRUST
12
DIAGNOSTIC TECHNOLOGY
11
10
7
8
9
EVALUATION TECHNOLOGY
DISABLED GRADUATION RATE
14
CHILDREN'S LIFE FUNCTIONS
PARENTS LIFE FUNCTIONS
21
FAMILY COST SAVINGS
20
19
13
15
16
17
18
DISABLED EMPLOYMENT RATE
CRIMINAL SYSTEM COSTS
INSTITUTIONS FOR THE DISABLED
SIBLINGS AND UNBORN LIFE FUNCTIONS
22
23
24
25
DISABLED INCOME
EDUCATIONAL SYSTEM COSTS
DISABLED POPULATION
26
28
29
WELFARE COSTS
27
NET PROGRAM COSTS
CHILDREN'S LIFE FUNCTIONS

Figure C-8. Causal diagram of hierarchical and interrelationship analysis of preschool academic education program thrust with emphasis on the ecnomics of service delivery

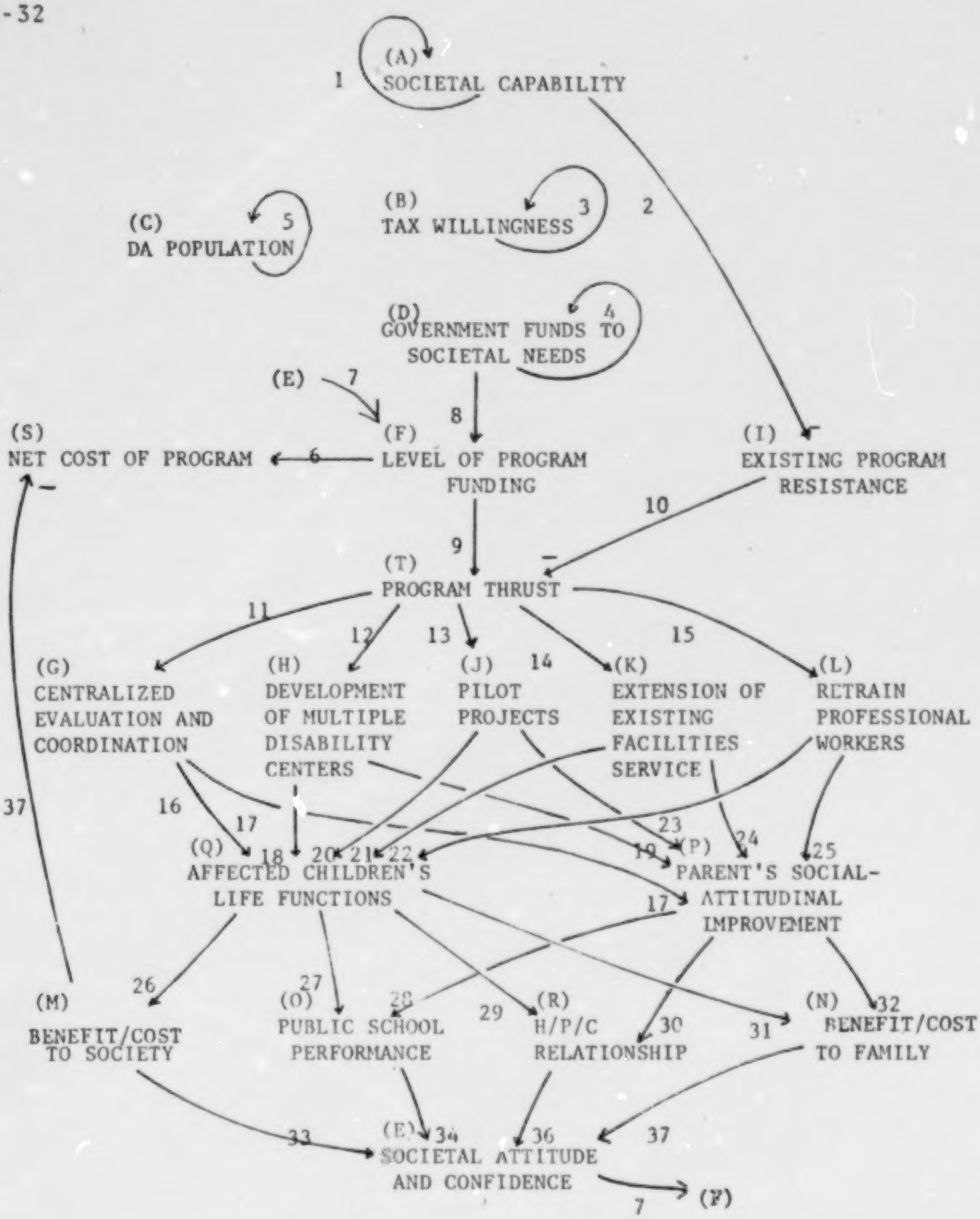

(A)
SOCIETAL CAPABILITY
1
2
(B)
TAX WILLINGNESS
3
(C)
DA POPULATION
5
(D)
GOVERNMENT FUNDS TO
SOCIETAL NEEDS
4
(E)
7
8
(S)
NET COST OF PROGRAM
6
(F)
LEVEL OF PROGRAM
FUNDING
(I)
EXISTING PROGRAM
RESISTANCE
10
9
−
(T)
PROGRAM THRUST
11
12
13
14
15
(G)
CENTRALIZED
EVALUATION AND
COORDINATION
(H)
DEVELOPMENT
OF MULTIPLE
DISABILITY
CENTERS
(J)
PILOT
PROJECTS
(K)
EXTENSION OF
EXISTING
FACILITIES
SERVICE
(L)
RETRAIN
PROFESSIONAL
WORKERS
37
16
17
23
24
25
(Q)
18 20 21 22
AFFECTED CHILDREN'S
LIFE FUNCTIONS
19
(P)
PARENT'S SOCIAL-
ATTITUDINAL
IMPROVEMENT
17
26
27
28
29
30
31
32
(M)
BENEFIT/COST
TO SOCIETY
(O)
PUBLIC SCHOOL
PERFORMANCE
(R)
H/P/C
RELATIONSHIP
(N)
BENEFIT/COST
TO FAMILY
33
34
36
37
(E)
SOCIETAL ATTITUDE
AND CONFIDENCE
7
(F)

Figure C-9. Causal diagram of hierarchical and interrelationship analysis for preschool academic education program with emphasis on logistics of service delivery

- °Most variables, including "societal attitude and confidence," "cost/benefit to society," "cost/benefit to families," "performance in public schools," "H/P/C relationship," and "children's life functions" all are approaching the upper limit of 1.0 by the year 2025.
- °Other variables, such as "net program costs" decline to zero.

Implications for Programs:

- °If preschool education programs for the disabled were so beneficial, with so few drawbacks, such programs would have already been implemented.
- °Limited efforts (pilot projects) are currently under way in the area of preschool education programs for the disabled and are part of the greater world-wide stress on pre-elementary education for all children.

Vocational Education

Vocational education (VE) was the remaining program thrust considered by the training and counseling work session. Its relationship to other program thrusts in the training and counseling area is depicted on the taxonomic tree in figure C-7.

Two factors were cited in the selection of vocational education as a particularly important program thrust: (1) the greater numbers of disabled persons who would enter school as a result of a preschool education program for the disabled, and (2) the current trend towards "mainstreaming" (the retention of disabled pupils in regular classrooms and schools). These two factors intensify the need for programs to meet the unique needs of the disabled, of whom few are able to move into society through continued academic education. The movement of the disabled through the educational system it was felt, may result in their being equipped with some marketable skills.

Target Population:

- °The estimated 5.2 million disabled students included in the school population by 1980 constitutes the target population.

Strategies:

- Focus is primarily upon the elementary and junior high or middle schools.
- Expenditures should be minimal and should center primarily upon some preorientation of teachers and on instructional materials.

Assumptions and Axioms:

- All programs will be incorporated within the public school system.
- All of the disabled population will be assimilated into the public school system.
- The program will be funded by the public with support from business and industry.
- Some facilities are currently available for implementation, although many more will be needed.
- The manpower needs for such a program will be substantial, particularly on the secondary school level.
- Industry and government will accept qualified disabled employees.
- Persons completing the program will be capable of being assimilated into the workforce without special labor laws, etc.
- All disabled students will advance to at least a junior-high level for vocational training, if necessary through social promotion.
- Adequate transportation to vocational training centers must be found.
- Types of training offered will be based on careful market research.
- Population distribution will be a key factor in the design and implementation of the program.
- Technologies for pre-vocational and vocational training of the severely disabled are not currently available.
- Productive employment is good for the individual.
- Vocational schools and training in the U.S. are held in general disrepute by the general populace and hence have often been neglected.

Objectives and Performance Requirements:

- °The main object of vocational education should be acquisitioned by the disabled of a specific marketable skill in an area in which jobs exist.
- °Possible jobs areas include custodial work, welding, carpentry, plumbing, or sanitation.
- °Other objectives include maximization of (1) self-sufficiency, (2) economic freedom, and (3) personal and social life choices.

Implementation Requirements:

- °Government funding is required since the program is administered through the public schools.
- °Additional support may come from industry and local communities.
- °In terms of manpower, either school staff should be retrained in vocational skills or vocationally trained persons should be educated so they can function in an educational setting.
- °Training of vocationally skilled persons for teaching positions may cause certification problems.
- °Union support of apprenticeship training for the disabled will be required.
- °Part of the implementation will take place in junior high and high schools and will require changes in both staff and facilities.
- °Costs in terms of both start-up and maintenance are high, as much as $500 per pupil per year above costs for nondisabled students.
- °For a target population of 2 million, the total cost would be $1 billion annually which is equal to the total tax revenue of 20 companies the size of Texas Instruments.
- °A considerable reallocation of GNP would be required and reallocation is not very likely.

Life Function Analysis:

- °Salutary effects upon all life functions are anticipated.
- °Social-attitudinal functioning would (probably) receive the greatest improvement.
- °Significant gains would accrue in communication and cognitive-intellectual functioning.

°Slight to moderate improvement in mobility and health would occur.

°The communication functioning of disabled students with speech and hearing difficulties will be significantly improved.

Affected Individuals, Groups and Organizations:

°Nondisabled workers may be affected by increased competition for jobs.

°New jobs for professionals in training and counseling would be created.

°Schools would have to be architecturally adapted and special tools would have to be developed.

°Public and private organizations, other than public schools, would be similarly affected.

°Trade and craft unions would be affected by the resolution of issues relating to acceptance of disabled workers within union ranks.

°The family unit would be strengthened through a decrease in the financial burden imposed by a disabled member able to work.

°Possible deleterious effects could result from the changed roles within the family unit that would occur as a result of a disabled family member who worked.

Group-Discussion Consequences:

°There will be an increase in the productivity potential as the employability of disabled increases (link 15, figure C-10).

°If many disabled are trained for vocational positions, they may find a favorable job market because of increasing societal interest in vocational training.

Hierarchical and Interrelationship Analysis: (See figure C-10.)

°A lack of counterbalancing feedback cycles in this structure is evident.

Computer Generated Consequences:

°The majority of influences cause growth in the variables until some outside factor constrains further growth.

°The dynamics are approximately those of the previous program thrust and again are overly optimistic, but reflect nevertheless the views of the work session participants.

Implications for Programs:

- The program is believed to be cost-effective.
- Even current VR programs are cost-effective, GAO statistics indicate.
- Cost-effective benefits are considerably long term.
- Because cost-effectiveness is seldom a significant criterion in allocation of federal dollars, this program probably would not be put through.
- Public resistance would be a problem dependent upon employment.
- In unfavorable job markets, the nondisabled may particularly resent disabled workers' holding jobs and receiving special training at taxpayers' expense.

RESULTS FROM THE SERVICE-DELIVERY WORK SESSION

The service-delivery work session mainly considered the use of advocacy to deliver rehabilitation technologies to persons requiring them. Although other program thrusts were considered preliminarily, by consensus the group felt that the potential of advocacy had not been fully exploited in current approaches to service delivery and therefore chose to examine its possible usefulness more closely, especially in the context of transfer payment allocation and administration. A consideration of advocacy entailed changes to the existing service delivery taxonomic tree as shown in figure C-11.

The overall notion of advocacy, a term used among legislators, rehabilitation institutions, and other agencies, includes representing the interest of others; in this particular sense, advocacy encompasses the following areas.

Legal Advocacy: assuring that legal rights are represented without discrimination.

Policy Advocacy: ensuring that the interests of selected persons are represented in policymaking, as in lobbying.

System or Case Advocacy: ensuring the interests of groups of the chartered public, as in brokering.

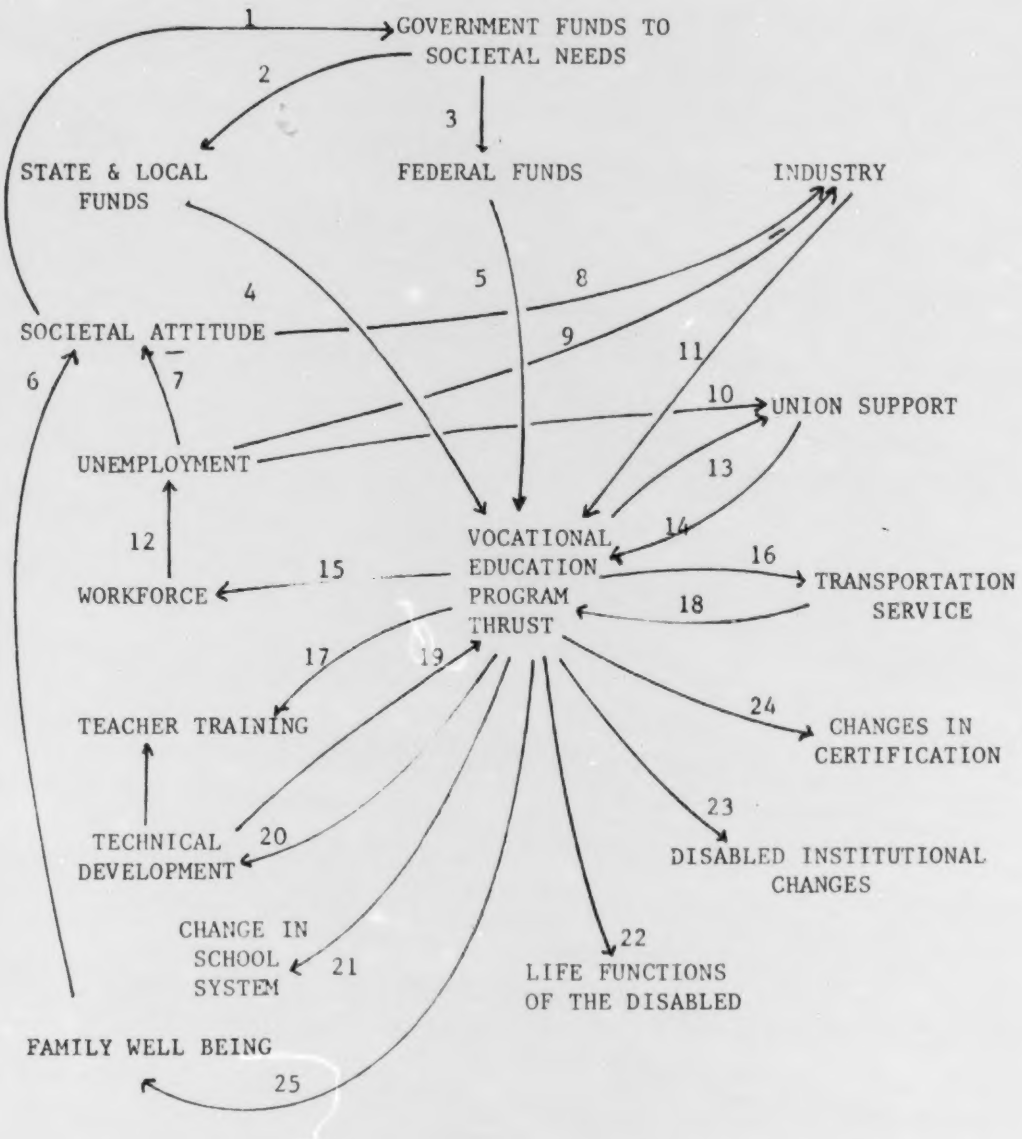

1
GOVERNMENT FUNDS TO SOCIETAL NEEDS
2
3
STATE & LOCAL FUNDS
FEDERAL FUNDS
INDUSTRY
4
5
8
SOCIETAL ATTITUDE
9
11
6
7
10
UNION SUPPORT
UNEMPLOYMENT
13
12
14
VOCATIONAL EDUCATION PROGRAM THRUST
16
15
WORKFORCE
TRANSPORTATION SERVICE
18
17
19
TEACHER TRAINING
24
CHANGES IN CERTIFICATION
23
TECHNICAL DEVELOPMENT
20
DISABLED INSTITUTIONAL CHANGES
CHANGE IN SCHOOL SYSTEM
21
22
LIFE FUNCTIONS OF THE DISABLED
FAMILY WELL BEING
25

Figure C-10. Causal diagram of hierarchical and interrelationship analysis of vocational education program thrust

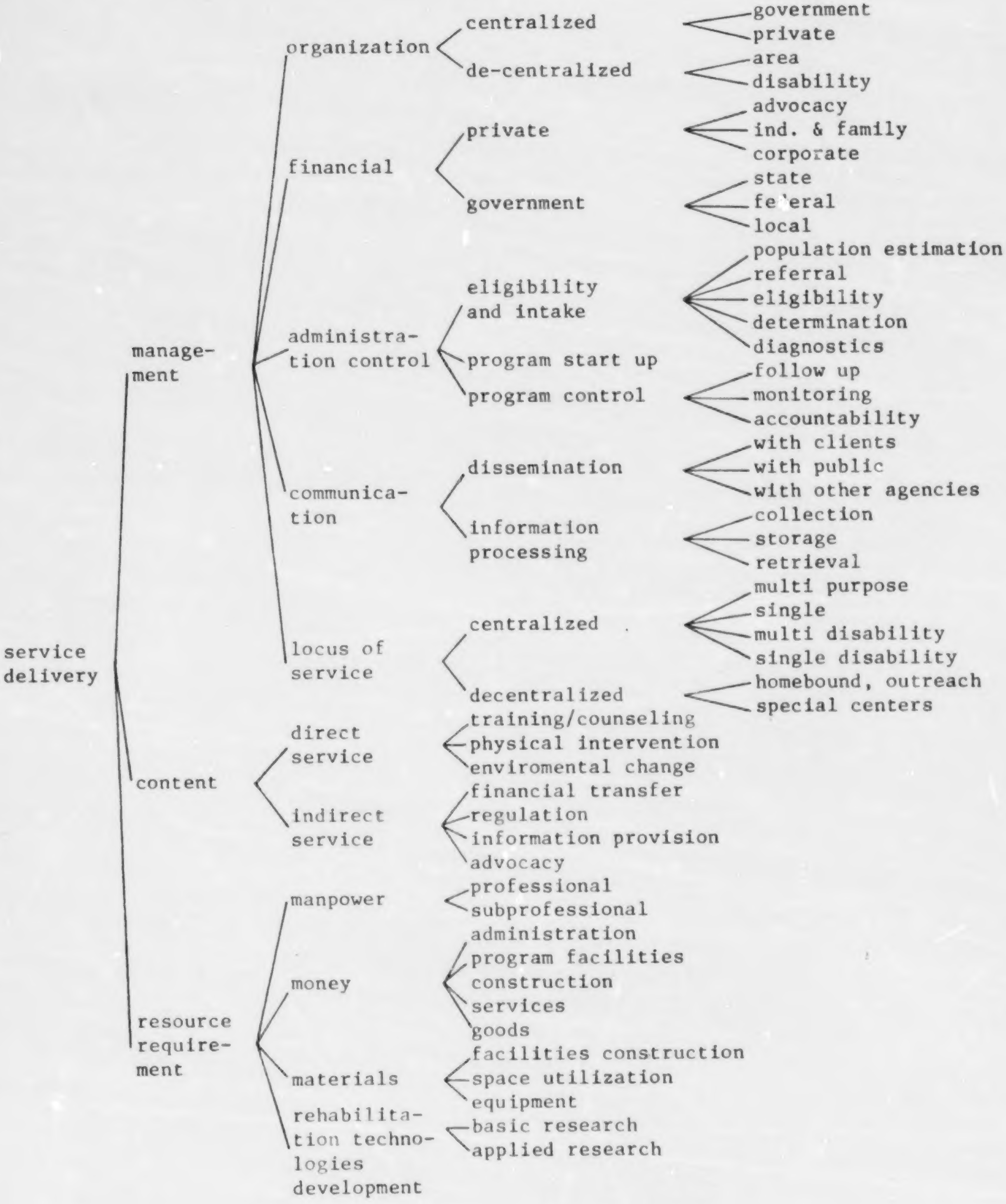

service delivery
management
organization
centralized
government
private
de-centralized
area
disability
financial
private
advocacy
ind. & family
corporate
government
state
federal
local
administration control
eligibility and intake
population estimation
referral
eligibility
determination
diagnostics
program start up
program control
follow up
monitoring
accountability
communication
dissemination
with clients
with public
with other agencies
information processing
collection
storage
retrieval
locus of service
centralized
multi purpose
single
multi disability
single disability
decentralized
homebound, outreach
special centers
content
direct service
training/counseling
physical intervention
enviromental change
indirect service
financial transfer
regulation
information provision
advocacy
resource requirement
manpower
professional
subprofessional
money
administration
program facilities
construction
services
goods
materials
facilities construction
space utilization
equipment
rehabilitation technologies development
basic research
applied research

Figure C-11 Tree Diagram: technology levels for service delivery

Self Advocacy: ensuring the interests of groups banned together for the purpose of legal policy, system, or case advocacy.

Citizen Advocacy: ensuring that private citizens who volunteer their service are represented as benefactors.

Regardless of form, advocacy is used to (1) monitor client and service delivery-system interactions, (2) represent the interest of clients in instances of disservice, lack of service, or excessive service, and (3) advocate policy changes as necessary for the system or clients.

Target Population:

- °All members of the disabled population without regard for whether they are now or have been served.

Strategies:

- °Legal advocacy is a strategy which is useful for securing individual rights and setting precedents with advocacy systems.
- °Citizen advocacy can be used to recruit, train, or designate help in support of the disabled.
- °Self advocacy is manifested by contributions to payroll taxes, insurance premium payments, income maintenance payments, and more overt forms.
- °While the previous three "strategies" can be thought of as providing service when the current system fails, case and policy advocacy are directed toward making the current system work.

Assumptions and Axioms:

- °The following assumptions or axioms are considered to be inherent in assessing the advocacy program thrust
  - °Transfer payments for the disabled will increase in number and scope, or they will increase in number or scope as time goes by.
  - °Transfer payments might not be a successful form of service delivery unless they are linked to some advocacy system in order to ensure accountability based on the need of disabled.

- °Disabled individuals have rights which are not now being recognized, and some disability related laws are not being enforced.
- °Greater public awareness will bring greater response to the needs of disabled individuals, groups, or individuals and groups.
- °Support for advocacy programs must come from either public (including governmental) sources, private (including charity) sources, or both.
- °The more money devoted to advocacy programs, the better the programs are likely to be.
- °The disabled are not always aware of available services.
- °The disabled prefer environments as similar as possible to those of the nondisabled.
- °Socioeconomic variables (in scenarios) can be specified.
- °Transfer payments can reduce the need for organized delivery of direct services.
- °Individuals can be held responsible and accountable for assessing their own needs.
- °Market imperfections can be corrected by legislation and other means.
- °National health insurance may be imperfect.
- °Large bureaucracies have difficulty providing quality service delivery.
- °Services can handicap, as well as help, the disabled.
- °Advocacy is a necessary condition for the delivery of quality human service.
- °Advocacy resources differ depending on advocacy goals and activities.
- °Advocacy can work within the system.
- °Advocacy works best when it engenders cooperation from inside and outside the system.
- °All disabled persons sometimes require an advocate.
- °Professional and administrative support is necessary for advocacy to work inside the system.
- °Advocacy offers a practical accountability mechanism in service delivery.

Objectives and Performance Requirements:

- °Affirmative use of advocacy is seen to promote the following objectives:
  - °To provide overall stability in the system-client environment.
  - °To monitor and collect information about system functioning.
  - °To insure actual delivery of necessary services.
  - °To provide for income redistribution and maintenance.
  - °To provide for economic self-sufficiency.
  - °To reduce the number of disabled persons in the poverty category.
  - °To increase the efficiency of the overall service-delivery system through elimination of overhead, duplication, and excessive service.
  - °To promote decentralization and deinstitutionalization of services.
  - °To reduce the required litigation.
  - °To measure delays in service delivery and keep records of those unserved.
  - °To promote the socioeconomic status of disabled clients.
  - °To promote accountability within the service-delivery system.
  - °To adequately represent disabled clients within society by upgrading client participation in public processes and policymaking.
  - °To increase clients' knowledge of rights and services and to advocate the interests of clients who are underserved, overserved, or in jeopardy.

Implementation Requirements:

- °Advocacy requires funding and manpower resources which may be either public or private, mandatory or voluntary.
- °Advocacy requires a firm data base for implementation.
- °The type of advocacy system which is most appropriate must be determined through testing, data collection, and assessment.

°Resource personnel within the advocacy system must contribute knowledge about system administration and behavior.

°Advocacy management must secure financial resources from federal, state, local, and private sources.

Life Function Analysis:

°Some improvement within all life-functions is perceived.

°Legal advocacy will affect mobility, social-attitudinal, and communication functioning.

°System or case advocacy will influence health and communication.

°Citizen and self advocacy will primarily benefit social-attitudinal functioning.

°Policy advocacy will primarily benefit health, mobility, and communication functioning.

°These five advocacy types may produce some adverse affects upon social-attitudinal functioning of certain disabled groups now otherwise served.

Affected Individuals, Groups, and Organizations:

°The general population, the technological community, established organizations and families are the primary populations affected in an advocacy system.

°The general population is affected by increased communication, interaction, and involvement with disabled persons through advocacy.

°The general population may also experience an additional financial burden, even though over time, advocacy may lessen the cost of current delivery systems.

°Advocacy funds may be balanced by funds unspent on overhead, duplication, and unnecessary or excessive service.

°During periods of increased financial burden for the general population, disposable income would be reduced.

°The technological community will benefit from increased demand for services and from increased communication.

°The workplace and marketplace may be restructured by advocacy because of demands for a higher rate of architectural adaptation.

°Private charities may be affected by an alteration in the magnitude of donations to such charities.

°In an advocacy system, rehabilitation organizations will be expected to operate more efficiently and cooperate more fully with each other.

°Advocacy initiated financial transfers may provide the family with still further resources to alter priorities in living.

°Because of personal autonomy afforded disabled individuals as a result of their being raised above the poverty level and provided with services independent of the family, the disabled individual can better function as a sustaining element within a family.

°Adjustments within the family unit will be made.

°The increased expectations engendered within the disabled by the communication effects of advocacy may place additional pressures upon the family unit because of an inability to satisfy the unaccustomed wants of the autonomous disabled.

Group-Discussion Consequences:

°Consequences are dependent upon two factors:

  °The capacity of advocacy to produce changes in organizations and procedures, and the capacity of advocacy to maintain an up-to-date review of both direct and indirect service-delivery systems.

°The following systems are predicted:

  °Advocacy may result in major policy reform.

  °Advocacy may result in deinstitutionalization of a significant segment of the disabled population.

  °Advocacy may result in institutional change, such as the retraining of personnel within rehabilitation institutions and reduction in staff size because of deinstitutionalization of clients and recruitment of personnel for the advocacy system from among institutional personnel.

  °Advocacy may result in a disabled population which is more visible to the general public.

  °Advocacy may enable more disabled persons to become employed.

°Advocacy may result in market uncertainties and imperfections caused by the inadequacy of present knowledge about market potentials integral to the advocacy system.

Hierarchical and Interrelationship Analysis: (See figure C-12.)

°Figure C-12 shows the following causal links:

°Advocacy is in a cycle with total funds (including direct services and transfer payments) and affects direct services and transfer payments in order to ensure accountability based upon need (links 6, 7, 16, 18).

°Greater public awareness will bring greater response to the needs of disabled individuals, groups, or individuals and groups (links 22 and 26).

°Support must come from both public and private sectors (links 1 and 8).

°Transfer payments may reduce the need for organized delivery of direct services (links 12 and 19).

°Indirectly, advocacy may reduce the number of disabled persons in the poverty category (link 27).

°Institutionalization of disabled persons is diminished (link 13).

°Socioeconomic status of disabled persons promoted by advocacy to that of the nondisabled population (links 15, 16, 17).

°Life functions are improved (links 14, 15, 24, 10, 12).

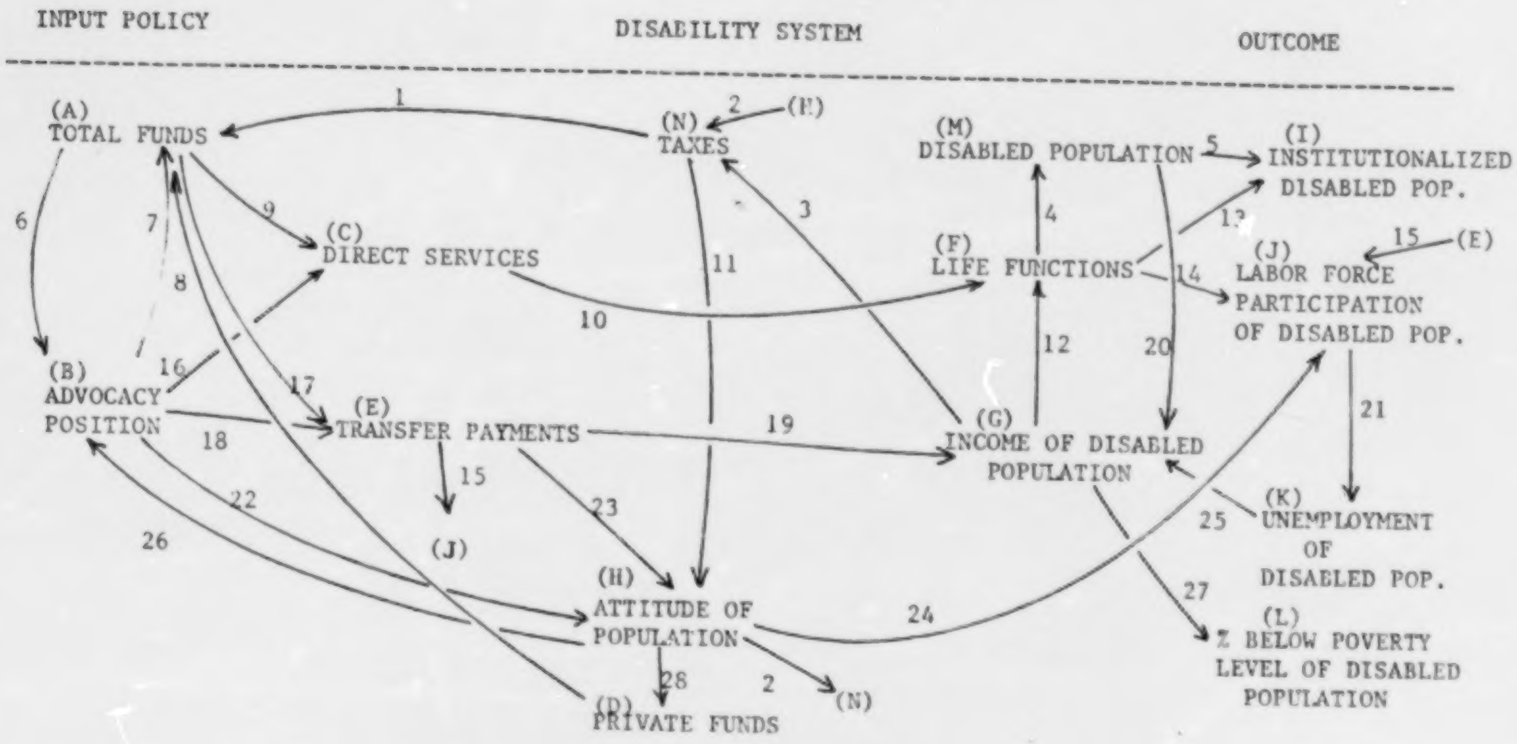
°Initially, additional tax burdens are placed upon the general population (link 11).

°Private donations to charities will be changed by public attitude (link 28).

°Economics will strongly affect service-delivery funds through public attitude (links 2 and 28).

°More disabled persons become employed (link 15).

°Three major levels of hierarchy are characterized by the model of the advocacy program thrust in figure C-12: (1) the input or policy level, (2) the disability system level, and (3) the outcome level.


INPUT POLICY
DISABILITY SYSTEM
OUTCOME
(A) TOTAL FUNDS
(N) TAXES
(H)
(M) DISABLED POPULATION
(I) INSTITUTIONALIZED DISABLED POP.
(C) DIRECT SERVICES
(F) LIFE FUNCTIONS
(J) LABOR FORCE PARTICIPATION OF DISABLED POP.
(E)
(B) ADVOCACY POSITION
(E) TRANSFER PAYMENTS
(G) INCOME OF DISABLED POPULATION
(K) UNEMPLOYMENT OF DISABLED POP.
(J)
(H) ATTITUDE OF POPULATION
(L) % BELOW POVERTY LEVEL OF DISABLED POPULATION
(D) PRIVATE FUNDS
(N)
1
2
3
4
5
6
7
8
9
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2

Figure C-12. Hierarchical and interrelationship analysis of service delivery by advocacy.

°Taxes and private fund variables are related issue factors included within the disability system level.

°The model, like previous causal diagrams, does not include all of the assumptions, objectives, performance and implementation requirements, life function analyses, and consequence statements because it is at a more aggregated level than the descriptions given in the respective sections.

°The advantage of the model is that it exhibits the advocacy program thrust in totality.

°The model is assumed to operate for a particular disability group and advocacy systems.

°Input values would be adjusted for different combinations of target groups and programs.

°In considerations of the major interactions within the model, the bulk of funds is currently directed toward direct services (medical services, medical transfer payments, etc.) and these are perceived as directly influencing life functions. Improvements in life functions, in turn, reduce institutionalization and enhance the labor force participation of disabled, which lowers the unemployment rates.

°Transfer payments, which are perceived as enhancing income of the disabled, would provide an indirect assist to life functions and therefore also improve the potential for employment of disabled.

°The negative effects of transfer payments on the attitude of population (link 23) as well as on labor force participation of disabled was also deemed important to the model.

°An important substructure within the model is the tight loop between advocacy and total funds.

°The intervention policies would explore the extent to which advocacy is funded. One policy would be the particular percentage or proportion of funds that are directed toward direct services as opposed to transfer payments. Another would be the particular proportion of advocacy activities that were directed toward services as opposed to transfer payments and in addition to attitudes of the population.

°There are some complex patterns that can be perceived within the model structure. One notion was that taxes were actually the source of funds and in fact some of the activities that were being conducted had implications that tax funds would increase if the income of disabled were increased (link 3). On the other hand, as taxes increase, the attitude of the population at large might be influenced in a negative fashion.

°The attitude of the population at large would influence the rate or extent to which private funds would be pumped into the system. In other words, an attempt to increase the total funds through an increase in taxes might actually decrease the total funds, because of the negative loop including taxes, attitude of population, private funds, and total funds.

Computer-Generated Consequences:

°Results under the advocacy position corresponding to the Scenario I can be summarized as follows:

°Funds and services to the disabled population increase, steadily following the historical trend. This increase is due to the assumption that advocacy position will keep on increasing at a steady rate.

°Coupled with the increased income paid and total funds available, the percentage of the disabled population below poverty level diminishes with time. This decrease is also due to the decrease in the unemployment rate of the disabled population in time.

°Labor force participation of the disabled population gradually increases up to the year 2022; then it starts decreasing. This may be explained by the decline of the attitude of the population in general to a critical low level by that time.

°Disabled population decreases gradually because of increases in their life functions and increases in their participation in the workforce.

°The attitudes of people in general deteriorate with time as the burden of taxes on the public increases, but towards the end of the time span, it almost stabilizes.

°The increase in life functions in time is a result of the increase in funds and services to the disabled population.

°The institutionalized disabled population increases gradually until the year 1980 and then starts decreasing at a moderate rate. The decrease may be explained as the effect of a broader recognition of the disabled population initially, followed by the effect of improved life functions for the disabled.

Implications for Programs:

°The major policy considerations in the development of an advocacy system involve (1) the relationship of the advocacy system to current social welfare programs, (2) accountability, (3) financial and administrative responsibility, and (4) staffing.

°Whatever type of advocacy system is developed, it should be as compatible as possible with other social services currently implemented or under development.

°One possibility for start-up of such a program is the use of information services currently implemented or under development to provide referral services at the local level.

°An advocacy system should be based on careful "market analysis" and should incorporate adequate accountability measures to ensure that it meets the needs and protects the rights of the individuals it is designed to serve.

°Initial funding for an advocacy system will almost certainly have to come from the federal government.

°Long-term financial support and administration of the system should be the responsibility of state and local governments.

°Private involvement in the system may be encouraged through tax incentives and federal start-up funds.

°As with many "new federalism" programs, a predictable problem with such a funding arrangement is accountability in the spending of federal money.

°The staff of an advocacy system will probably include both professionals and paraprofessionals.

°Professional staff members will need extensive and costly training, and the expense of this training will be justifiable only in the context of a long-term commitment to the advocacy system.

- Paraprofessional staff members will need only minimal training and can probably be recruited at a moderate cost from the ranks of retirees, volunteers, and other such persons.
- Other paraprofessional staff members such as students and housewives may be hired on a short-term or part-time basis.

APPENDIX D
COMPILATION OF VARIABLES FOR A GENERALIZED MODEL

Subsequent to panel meetings, the models for each of the program thrusts were examined by project team members. The models were found to bear more than a casual resemblance to each other, indicating to the project team that a generalized or "generic" model might be constructed to reveal consequences throughout the entire spectrum of rehabilitation technologies and program thrusts.

The first step in producing a generalized model consisted of close examination of and compilation of all of the variables considered in the program-thrust oriented models. Table D-1 summarizes the variables which appear in models and verbal consequence statements from all program thrusts.

TABLE D-1
SUMMARY OF PROGRAM-THRUST VARIABLES AND PARAMETERS

Element List	Physical Intervention	Environmental Change	Training & Counseling	Service Delivery
SCENARIO VARIABLES				
Tax Willingness	X	X	X	X
Capability	X	X	X	X
Public Attitude		X	X	X
Total Disabled Population	X			
Funds for Societal Social Needs	X			

TABLE D-1 (CONTINUED)
SUMMARY OF PROGRAM-THRUST VARIABLES AND PARAMETERS

Element List	Physical Intervention	Environmental Change	Training & Counseling	Service Delivery
PROGRAM-THRUST VARIABLES				
Level of Program Funding	X	X	X	X
Target Disabled Population	X			
Immobilized Disabled Population		X		
Institutionalized Disabled Population				X
Community Integration		X		
Trained Technologist	X			
Health-Care Professionals			X	
Art of Rehabilitation	X			
Market for Rehabilitation Technology	X			
Economic Benefits to Industry		X		
Corporate Funds	X			
Private Funds	X			X
Basic Research	X			

TABLE D-1 (CONTINUED)
SUMMARY OF PROGRAM-THRUST VARIABLES AND PARAMETERS

Element List	Physical Intervention	Environmental Change	Training & Counseling	Service Delivery
PROGRAM-THRUST VARIABLES				
Applied Research	X		X	
Existing Program Resistance			X	
Adapted Environment		X		
Safety		X		
Supplemental Income		X		
Transfer Payments			X	
Job Matching		X		
Proxemics		X		
Family Cost Savings			X	
Attitudes of Family		X		
Status of Family		X		
Diagnostic Technologies		X	X	
Education Technology			X	
Evaluation Technology			X	

TABLE D-1 (CONTINUED)
SUMMARY OF PROGRAM-THRUST VARIABLES AND PARAMETERS

Element List	Physical Intervention	Environmental Change	Training & Counseling	Service Delivery
Advocacy Position				X
Non-Medical Services				X
Medical Services				X
Quackery	X			
Regulatory Acts	X			
Facilities for the Nondisabled		X	X	
Demand for Education			X	
Legal Requirements	X		X	
Utilization by Disabled	X			
LIFE FUNCTIONS				
Mobility	X	X	X	X
Social-Attitudinal	X	X	X	X
Communication	X	X	X	X
Cognitive-Intellectual	X	X	X	X
Health	X	X	X	X
Parent Life Functions			X	

TABLE D-1 (CONTINUED)
SUMMARY OF PROGRAM-THRUST VARIABLES AND PARAMETERS

Element List	Physical Intervention	Environmental Change	Training & Counseling	Service Delivery
Political Influence	X			
Total Unemployment		X		
Centralization			X	
Decentralization			X	
Criminal System Costs				X

The variables from the individual program thrusts were consolidated and generalized into a list of 20 for use in the generic model of rehabilitation-oriented social dynamics. Table D-2 lists the resulting generalized variables.

TABLE D-2
CONSOLIDATION AND GENERALIZATION OF VARIABLES AND PARAMETERS

Variable	Letter Designation
SCENARIO GROUP	
Societal Capability	A
Tax Willingness	B
Funds for Social Needs	C
Disabled Population	D
PROGRAM-THRUST GROUP	
Public Attitude	F

TABLE D-1 (CONTINUED)
SUMMARY OF PROGRAM-THRUST VARIABLES AND PARAMETERS

Element List	Physical Intervention	Environmental Change	Training & Counseling	Service Delivery
Sibling Life Functions			X	
CONSEQUENCE VARIABLES				
Disabled Productivity	X	X		
Total Productivity		X		
Disabled Income	X		X	X
Disabled Graduation Rate			X	
Disabled Employment		X	X	X
Welfare Costs			X	
Disabled Visibility		X		
Self-Image of Disabled		X		
Disabled Access to Jobs		X		
Educational System Costs			X	
Aggregate Costs	X			
Total Labor Force		X		X

TABLE D-2 (CONTINUED)
CONSOLIDATION AND GENERALIZATION OF VARIABLES AND PARAMETERS

Variable	Letter Designation
Level of Program Funding	E
Governmental	
Corporate	
Private	
Rehabilitation and Program Thrust	L
Research	
Basic	
Applied	
Educational and Training	
Disabled Persons	
Technologists	
Health-Care Professionals	
Services	
Medical	
Non-Medical	
Locus	
Management	
Administration	
Control	
Organization	
Locus	
Manpower	
Trained Technologists	
Health-Care Professionals	
Rehabilitation Technologies	
Market for Rehabilitation Technologies	
Resistance to Program Changes	
Quackery	
Utilization by the Disabled	
Facilities for the Disabled	I
Facilities for the Nondisabled	H
Costs	J
Research	
Education	
Services	
Management	
Manpower	
Technology	
Family Costs	
Welfare System	
Criminal System	

TABLE D-2 (CONTINUED)
CONSOLIDATION AND GENERALIZATION VARIABLES AND PARAMETERS

Variable	Letter Designation
Advocacy Position	G
Regulation	K
CONSEQUENCE GROUP	
Life Functions	O
Mobility	
Social-Attitudinal	
Communication	
Cognitive-Intellectual	
Health	
Status of the Disabled	N
Self-Image	
Visibility	
Community Integration	
Access to Jobs	
Employment	
Income	
Earned	
Supplemental	
Political Influence	
Education	
General	
Vocational	
Education Technology	
Demand	
Proxemics	
Status of Families with Disabled Member	P
Sibling Life Functions	
Parent Life Functions	
Total Labor Force	R
Total Employment	S
Total Jobs Available	Q
Economic Productivity	T
Disabled	
General Population	
Perceived Environment	M
Directly Related	
Incidentally Related	

APPENDIX D

GLOSSARY

ANSI	American National Standards Institute
ASA	American Standards Association
ATBCB	Architectural and Transportation Barriers Compliance Board
CCDD	Consortium Concerned with the Developmentally Disabled
CD	Community development
CDC	Child Development Consultant
CHD	Coronary heart disease
CP	Cerebral palsy
CRC	Colon/rectum cancer
DHEW	Department of Health, Education, and Welfare
DM	Diabetes mellitus
DOT	Department of Transportation
EM	Emphysema
EMR	Educable mentally retarded
EP	Epilepsy
EWF	Employed workforce
FAA	Federal Aviation Administration
FmHA	Farmer's Home Administration
GAO	General Accounting Office
GNP	Gross national product
GRS	General revenue sharing
GSIM	Geometric Simulation
HAP	Housing Assistance Plan
HCDA	Housing and Community Development Act
HEW	Department of Health, Education, and Welfare
HI	Hearing impairment
HUD	Department of Housing and Urban Development
IM	Income maintenance
ISA	International Standards Association
KD	Kidney disease
L	Lower
L_c	Lower-C

LHA	Local Housing Authority
M	Medial
M_c	Medial-C
MR	Mental retardation
NARC	National Association for Retarded Citizens
NIMH	National Institute of Mental Health
NNP	Net national product
NSF	National Science Foundation
NSPB	National Society for the Prevention of Blindness
OSTI	Organization for Social and Technical Innovation
PAE	Preschool academic education
POW	Pioneer on Wheels
PTA	Physical therapeutic agents
RA	Rheumatoid arthritis
RAPP	Research Applied to Policy and Practice
RD	Rehabilitation devices
SCI	Spinal Cord injury
SSDI	Social Security Disability Insurance
SSI	Supplemental Security Income
ST	Stroke
SZ	Schizophrenia
U	Upper
U_c	Upper-C
UMTA	Urban Mass Transportation Administration
VE	Vocational education
VI	Visual impairment

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